ENVIRONMENTAL ASSESSMENT BOARD

Ontario

ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARINGS

VOLUME: 48

DATE: Wednesday, August 21, 1991

BEFORE:

HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

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ENVIRONMENTAL ASSESSMENT BOARD
ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARING

IN THE MATTER OF the Environmental Assessment Act, R.S.O. 1980, c. 140, as amended, and Regulations thereunder;

AND IN THE MATTER OF an undertaking by Ontario Hydro consisting of a program in respect of activities associated with meeting future electricity requirements in Ontario.

Held on the 5th Floor, 2200 Yonge Street, Toronto, Ontario, on Wednesday, the 21st day of August, 1991, commencing at 10:00 a.m.

VOLUME 48

B E F O R E :

THE HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

S T A F F :

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MR. R. NUNN	Counsel/Manager, Informations Systems
MS. C. MARTIN	Administrative Coordinator
MS. G. MORRISON	Executive Coordinator

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D. POCH D. STARKMAN D. ARGUE	)	COALITION OF ENVIRONMENTAL GROUPS
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(Cont'd)

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F. MACKESY	ON HER OWN BEHALF
M. BADER	DOFASCO
B. TAYLOR D. HORNER	MOOSONEE DEVELOPMENT AREA BOARD AND CHAMBER OF COMMERCE

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L I S T o f E X H I B I T S

---Upon commencing at 10:04 a.m.

THE CHAIRMAN: Please be seated.

Mr. Poch?

MR. D. POCH: Thank you, Mr. Chairman. I just wanted to rise to advise the Board of the likelihood that I will not be able to finish my cross-examination; that is, I will have to return perhaps for a second round of cross-examination after next week in light of two facts: One, I returned from holidays on Saturday to find a bundle of interrogatories on my desk, but I also, of course, returned to find, as we all did, the fuel switching and standards exhibits which I think Hydro is quite candid in agreeing are a major change to the scope of the Panel 4 evidence.

So, I am having my advisors review that document as the hearing proceeds and I hope that we will be able to deal with it next week during my cross, but I feel it appropriate to advise the panel that it may be necessary to come back and I am sure I am not the only one in that position.

The other thing that happened was that this morning this arrived on my desk from Ontario Hydro. These are interrogatory answers. I haven't even had a chance to open the package yet. Some of

them are second-round interrogatories because of questions arising from supplementary documents that Hydro had filed and so on. That, too, may lead to some difficulty.

I am certainly prepared to proceed on Monday when it appears I will be reached, but I did want the panel to be aware of this difficulty and as I say, I hope it won't hold things up.

THE CHAIRMAN: Okay. Just before I call Mr. Campbell, is there anyone else who wants to make a similar type of submission?

All right. Mr. Campbell, do you have any comments to make?

MR. B. CAMPBELL: No, Mr. Chairman. We are ready to proceed with the panel, except I perhaps should say that we did receive, over the course of July, somewhere between 110 or 120 additional interrogatories, all of which, of course, have many, many parts or many of which have many, many parts. I always think that to give the simple number is highly misleading. And the people involved, including the members of this panel, I think, have done a remarkable job in trying to get them returned around as quickly as they have. And we continue to make every effort and we are quite happy to make reasonable accommodation.

Certainly in our point of view we have no objection to reasonable accommodation to those matters coming along.

My suggestion is we proceed along and if reasonable rearrangements need to be made, they be made.

THE CHAIRMAN: I just have a couple of comments to make; one about the general problem of interrogatories. It seems to me interrogatories fulfill two functions: 1, to assist the intervenors in cross-examining the Hydro panel; and 2, to prepare the intervenors for their own presentation.

The modus vivendi that has been for the first three panels I think has worked reasonably well. I would agree that from just the very volume of interrogatories - I think there are now three -- this panel has over a thousand interrogatories. The efforts have been heroic on both sides, on the part of the intervenors and also the Proponent.

It hasn't, from my perspective at least, created a difficult problem in proceeding with the panels, except perhaps lengthening in some cases the cross-examination, but the technique of transcript undertakings and so on seems to have worked fairly well.

This is a dynamic process. This is not

like what I am familiar with and perhaps others are familiar with where we have a static situation to consider. This is a dynamic process, the real world is going on while we are here determining these things, and we are going to have items such as the fuel shifting and matters of that kind will go on, I expect, throughout the entire hearing.

Certainly, the fuel shifting documents are significant, but they are not voluminous and they are not complicated. And I would think that most intervenors would be able to deal with those in a fairly short order.

However, as we have always said, we are not foreclosing anybody from raising matters which are relevant and important to these hearings at any time. And that is the way we have proceeded up to now and that way I think we will continue. All right.

Mr. Campbell?

MR. B. CAMPBELL: Thank you, Mr. Chairman. I have distributed to everybody here today, and the Board should have copies before it, a revised version of page 60 of Exhibit 260, which is the overheads being used by the panel.

I will tell you that the changes that the original page 60 deducted from the figures contained in

Exhibit 258, this 53 megawatt figure for standards that was already included in the basic load forecast. And in that sense, I think represents - and I am going to ask the panel to correct me if I am wrong - I think it really represents the right in the end bottom-line numbers to use; is that correct, Mr. Burke?

MR. BURKE: Yes. The original page 60 is the bottom line.

MR. B. CAMPBELL: All right. Now, the revised page 60 is the exact figures from Exhibit 258 and it may be that the best thing to do is to mark this page 60A so that you have both sets of figures, in effect, in the package. And I would simply suggest that that be done.

We thought for consistency, we should show a chart that had exactly the numbers in 258. And then the original page 60, as I say, had the 53 megawatts deducted.

So, perhaps having originally thought I would ask that it be replaced entirely, maybe the sensible thing to do is to mark this as page 60A and just add it to the exhibit, if that would be satisfactory.

THE CHAIRMAN: That will be satisfactory.

Has 60A been generally distributed?

MR. B. CAMPBELL: Yes, it has, Mr. Chairman.

PAUL JONATHAN BURKE,
AMIR SHALABY,
JULIA MARION MITCHELL,
MARION ELIZABETH FRASER,
LYN DOUGLAS WILSON,
WILLIAM OSBORNE HARPER; Resumed

DIRECT EXAMINATION BY MR. B. CAMPBELL (cont'd):

Q. Mr. Wilson, I want to come back to you and turn from discussions of potential --

THE CHAIRMAN: Excuse me, Mr. Campbell.

MS. MORRISON: Is there a new exhibit added to the list?

THE CHAIRMAN: Oh, yes, I forgot. I have not been doing my duty. I have got to read in the new exhibit. Excuse me, Mr. Campbell, I apologize.

Filed by Energy Probe entitled, Seven Problems with Subsidized Utility-driven Conservation Programs. It has been given number 262, so the next exhibit will be 263.

---EXHIBIT NO. 262: Document entitled, "Seven Problems with Subsidized Utility-Driven Conservation Programs".

THE CHAIRMAN: Excuse me, Mr. Campbell, you may now proceed. I think you were going to ask Mr. Wilson a question.

MR. WILSON: Yes, I think that is right.

MR. B. CAMPBELL: I think he was making a careful note of the title of that exhibit.

Q. Mr. Wilson, we have heard yesterday from Mr. Burke and others about the potential, the analysis of potential for demand management, and I want to move on to the general area of expectations as to what you hope to be able to achieve in the demand management area and just generally, first, if you could outline Hydro's assessment of what demand management can contribute to filling the gap between the forecast demand for electricity and Hydro's ability to supply.

MR. WILSON: A. In the 1989 Demand/Supply Plan, we were planning on 2,000 megawatts of electrical efficiency improvement, 1,000 megawatts of load shifting and 700 megawatts of peak clipping for the year 2000. And the path to these levels was updated in Exhibit 76 in January of 1991.

Now, as I noted earlier, the policy environment for demand management has changed. We heard about that yesterday. Key aspects were increased allocation of funds to demand management, amendments to the Power Corporation Act which had been proposed that will permit economic fuel substitution and joint efforts with industry to develop energy-efficient products and services in Ontario and government

interest in aggressive energy efficiency standards.

Since Hydro isn't able to make decisions on its own about how and when standards, codes and efficiency regulations will be used to increase energy efficiency in Ontario, we have sketched out five cases. These are described in Exhibit 258, scenarios for demand management including fuel switching and standards.

Now, this slide, which I believe is page 60A in Exhibit 260 shows, at the top, the level of savings represented in the Demand/Supply Plan, the 1989 plan, of 2,000 megawatts.

...

[10:15 a.m.] The additional five cases are shown below it, and these cases we think span the range of possible courses of action that the government and Hydro could consider.

Although we haven't had time to really put polish on these cases, we feel they provide a reasonable basis to make conclusions for planning purposes. I will be describing these cases in just a moment.

Q. Perhaps you could start by describing the overall approach that Hydro has taken in developing these cases.

A. We have taken a straightforward approach building on the method that we used to develop the demand management plan in Exhibit 25 and the subsequent report, Exhibit 76.

In order to create the five demand management cases, we established four simplifying guidelines. The first two deal with fuel switching. The first one is if it is economic to use natural gas instead of electricity, then we will promote fuel switching.

If electricity is still going to be used, then we will promote efficiency of electrical use.

Q. That's your second guideline, is it?

A. That's the second point.

Q. Now the third and fourth deal with a balance of mandation and persuasion, so the third point is that if standards, codes and regulations can be used to increase energy efficiency, promote fuel switching and electrical efficiency improvements, then we are assuming that those standards, regulations and codes will be used.

Now, if mandation is not appropriate, then Hydro's energy management programs will be used to accomplish our goals.

Q. All right. Now can you explain how these guidelines were applied when the five demand management cases were developed.

A. Well, the five case are described on pages 6 and 7 of Exhibit 258. I will speak first about Case A. What you have on the screen is quite a detailed page which is taken directly from the Appendix C1 of that exhibit.

We see this as a minimal case in which we use our new freedom to promote fuel switching using programs and we are relying entirely on programs to get results.

We applied the first two guidelines to promote fuel switching where it is economic and to

promote electrical efficiency otherwise. The bulk of the increased electricity savings comes from fuel switching.

Our own energy management programs capture 870 megawatts of fuel switching in the residential and commercial sectors.

THE CHAIRMAN: I'm sorry. What was that figure?

MR. WILSON: 870 megawatts. And you will see that at the bottom of the column under fuel switching labelled "Programs: A summary for all sectors."

There's roughly equal quantities of fuel switching in the residential and commercial markets.

THE CHAIRMAN: I'm sorry, I don't see it. Where is it? Which column is it in? I am looking at page 61; is that right?

MR. B. CAMPBELL: Q. Mr. Wilson, it's the Ontario energy efficiency block in the middle, I believe.

THE CHAIRMAN: I see.

MR. B. CAMPBELL: Q. And under fuel switching programs, the bottom number against all sectors is 870; that's the number you are referring to?

THE CHAIRMAN: I have got it now. Thank

you.

MR. WILSON: Now, we have assumed that our success in achieving market penetration in both fuel switching and electrical efficiency improvement will follow the assumptions that we documented in Exhibit 76. And that there will not be any significant advancement of energy efficiency regulations beyond those that have already been assumed in the 1990 load forecast.

So, we are relying entirely on our own efforts to overcome market obstacles to fuel switching and efficiency improvements for electrical goods. These programs capture about 31 per cent of the potential for fuel switching and electrical efficiency improvement, 31 per cent of the potential that Mr. Burke outlined yesterday.

So, this is the minimal case.

THE CHAIRMAN: What's the 100 per cent figure?

MR. WILSON: A hundred per cent would be just to the left of the number you are looking at in the first block of numbers entitled "Potential" at the top, you will see that there is a--

THE CHAIRMAN: Right.

MR. WILSON: --two numbers there. There

is total EEI, which is 5,360, and two columns over, fuel switching which is 3,120. Those numbers combined, 8,480 would be the total potential.

MR. B. CAMPBELL: Q. I think, Mr. Wilson, if you would go on and describe Case B then.

MR. WILSON: A. Certainly. Case B starts in the same way that Case A does: Hydro would promote fuel switching where it is economic and electrical efficiency improvement otherwise.

The difference in this case arises in 1995. The case assumes that from 1995 onwards the Provincial Government will have established -- use its regulatory authority to prohibit the use of electric resistance space and water heating in new houses where natural gas is available and will raise efficiency standards for electrical products in the residential building code to achieve 50 per cent of the economic potential for induced electrical efficiency savings that have been assumed in the load forecast.

Because mandatory fuel switching and efficiency regulations capture all of the potential savings to which they apply, the overall results in Case B are higher. It's a 1,000 megawatts, 1,060 for fuel switching and 2,230 megawatts for electrical efficiency improvements.

And this increases the proportion of the potential savings from 31 per cent in Case A to 40 per cent in Case B.

You will see the critical differences on the chart, Appendix C2. If you look under Ontario energy efficiency and first of all under fuel switching, you will see that in the residential row there are 270 megawatts identified for the residential market. The programs have accomplished 340 megawatts. That's higher than we had earlier assumed for the residential market.

The next change is in the next column over under electrical efficiency improvements and under standards and you will see that the numbers in that column add to the total at the bottom of 690 megawatts.

That has the effect, as Mr. Burke explained yesterday, of slightly reducing the amount of savings we will get through our programs, but the overall improvement of electrical efficiency is higher because of the high penetration rates, virtually 100 per cent, that you achieve through standards.

Q. Perhaps you could then address Case C?

A. Well, Case C is the same as Case B, except that in 1995 the government regulation that

prohibits the use of electric resistance space and water heating is extended from just the residential market to include the new commercial buildings. And so that's the only difference between Cases B and C.

This increases fuel switching to 1350 megawatts and the overall results to 3580 megawatts. Now, this represents over 43 per cent of potential savings, so we have gone from 40 per cent, I believe, yes, from 40 per cent to 43 per cent.

Q. Ms. Fraser, I would just like to turn to you for a moment. You have a particular interest in responsibilities in the commercial sector. I guess my question to you is whether you feel that regulation prohibiting the use of electric space and water heating is the best way of getting higher results for the commercial sector.

MS. FRASER: A. Well, it is one way, but I think that could result in the loss of opportunities to optimize total energy efficiency in commercial buildings. Some large retail and office buildings are both cooling and heating during the winter months. They are cooling the core of the building and they are heating the perimeter.

Rather than using both electric air conditioning and gas space heating, an internal source

heat pump can be used to redistribute the heat from the core to the perimeter.

So, I believe it would be more effective to mandate the building code developed by the American Society of Heating, Refrigeration and Air Conditioning Engineers, otherwise known as ASHRAE 90.1, which you will hear about a bit more, to achieve slightly less winter electricity savings but could be more efficient from a total energy point of view over the whole year and for the whole building.

...

[10:25 a.m.] Q. All right. I take it that is one of the approaches that you would be looking at in more detail as you move forward into these areas?

A. Exactly. We are looking at it right now.

Q. All right. Now, Mr. Wilson, having briefly touched on the difference between B and C, could you go on, please, and outline briefly what Cases D and E involve?

MR. WILSON: A. Case D is similar to Case C. In Case C we had efficiency regulations for electrical building codes and electrical products that achieve 50 per cent of the potential. In Case D we have assumed those regulations are much more stringent and they capture 100 per cent of the potential for electrical efficiency improvement. We have retained the same requirement for the use of natural gas in new residential and new commercial buildings.

This has the effect of increasing the results to 3,920 megawatts and that changes the amount of the market we capture from 43 per cent to 46 per cent of the potential load saving.

Finally, Case E. Case E goes the furthest. It is similar to Case D except that the government's 1995 mandation of fuel switching doesn't

stop just at new commercial and residential buildings but extends to all existing residential and commercial buildings.

This means that if natural gas is available, then people will be obliged to switch from resistance electric heating to natural gas.

Now, clearly, this will be a far-reaching regulation and would be expected to significantly increase the amount of fuel switching. It rises to 2,120 megawatts and increases the overall results to 4700 megawatts. This would represent the capture of over 55 per cent of economic potential.

THE CHAIRMAN: And economic potential is column 1 plus column 3?

MR. WILSON: It is. It remains that throughout.

MR. B. CAMPBELL: Q. Now, having given that overview of the cases that are described in Exhibit 258, is it your view that all of the cases are real options?

MR. WILSON: A. Yes, I think so but only under some circumstances. The types of mandation visualized in Cases D and E are so aggressive that I doubt they would be adopted unless government and the public saw an energy supply crisis looming.

Q. And why do you say that?

A. In Case D, we have assumed that the government uses its regulatory authority to raise energy efficiency of all products and building types to the full economic level and this would force a large number of current products right off the market and create a significant burden for Ontario manufacturers and everyone else in the industry.

In Case E, the imposition of manditory fuel switching for existing, as well as new, residential and commercial buildings will generate an enormous surge of demand on the suppliers of equipment and alternative fuels.

One of the reasons why Case E's impact on electricity demand is so much larger than the other cases is the fact that it would apply to the enormous stock of existing buildings with electric space and water heating.

Q. Now, is it possible to say that Case E is simply not feasible?

A. Well, it is not -- if this manditory retrofit of heating systems was operated the way that Ontario law requires used cars to be recertified when they are sold, then I would expect a major fraction of the housing and commercial stock would undergo

conversion by the year 2000.

THE CHAIRMAN: I am sorry, I didn't hear that last part.

MR. WILSON: Well, when you sell a car today, it has to be recertified and brought up to proper safety standards. If the same approach were used to commercial and residential buildings, that when the building is sold it has to be retrofitted or upgraded to meet an efficiency standard, it would be -- one could visualize that it would be practical to operate on that basis. Whether it is desirable or not whether the public would see that is desirable is another question, but I believe it could be done that way.

MR. B. CAMPBELL: Q. And is that idea unprecedented?

MR. WILSON: A. Well, not entirely. If we can do it for cars, we can do it for buildings. And there are a few municipalities in the United States that require some level of efficiency tune-up of homes that are being resold or undergoing major renovations.

Q. Overall then, how do you see Cases D and E?

A. Well, I think they are feasible but not too likely.

Q. Now, are these the only cases that Hydro could have considered?

A. Well, no. It is clear that we could have developed many different variations of the themes covered in Cases A through E. And we fully expect the details are going to change as we work with government to raise efficiency standards and pursue economic fuel switching. And Ms. Fraser has already just suggested one such change.

However, I feel these changes cover the range of policy options open to the government and they represent Ontario Hydro's best efforts to improve electrical efficiency in Ontario. And we will be discussing some of the ramifications possibly a little later on today.

Q. Now, have you been able to make a comparison of your analysis with the figures filed by the government in Exhibit 249?

A. Yes, we have. The cases that we have been examining most closely ourselves in the recent weeks are Cases A, B and C. And they are the ones that correspond to the high conservation case discussed on page 35 in the Ontario government's Exhibit 249. That was entitled, "Potential for Energy Conservation and Carbon Dioxide Reduction in Ontario". That report says

that to achieve these savings --

Q. And there, the savings they are talking about are their high conservation scenario, as I understand.

A. The high conservation, that's right.

Q. All right. And I understand you are quoting right from that page of that report?

A. Yes. On page 35, the report says that:

> "To achieve these savings would require a combination of enhanced demand management programs, fuel substitution initiatives and an aggressive regulatory program using building codes and the Energy Efficiency Act."

They go on to say that:

> "The projection is ambitious in light of U.S. findings that typical electric utility programs for conservation and load management are not reaching all customers and are reducing energy use by less than 10 per cent."

Hydro - or Ontario I should say - would have to surpass the best current programs.

Q. And that is the end of the quote from

that?

A. That is the end of the quote.

Indeed, the high conservation case was described by Mr. Moran, counsel for the Ontario government, as a scenario with, as he said, "optimistic adoption of energy efficiency measures". I stress the word "optimistic" and this is at transcript 8045.

When we extrapolated our Cases B and C to the year 2005, we found that the Ministry's case fell between those two cases.

Q. Now, has Hydro come to any conclusion about the level of demand management that should be relied on for planning purposes in these proceedings, and I guess that is somewhat of a rhetorical question given what you spoke to yesterday? Perhaps you could address that point.

A. Well, having given some thought over the last five or six weeks to these five different cases, we think it is reasonable that by the year 2000 the province can achieve about 3,500 megawatts of electrical energy savings through fuel switching and electrical efficiency improvements, in addition to shifting 1000 megawatts of demand from peak to off-peak hours and 700 megawatts of peak demand that could be curtailed for short periods through interruptible

supply contracts. This is a total of 5200 megawatts and was discussed yesterday in the hearing.

This is shown on the chart as a vertical, an orange vertical line, and you could see that it cuts very close to the level of Case C.

We see this as a very challenging level for electricity demand reduction, even more challenging than the Ministry's high conservation case.

Now, the goal for saving electricity is virtually the same as C. We are not saying that the assumptions behind Case C describe exactly the way the results will be obtained.

For example, the tough new energy efficiency regulations may not be ready until 1996 instead of '95, but they could be more stringent than the ones we have assumed in Case C. The results would be the same.

We believe we can work out a suitable accommodation of government mandation and efficiency programs of our own that would accomplish this level of electricity savings.

The simple point is: We think it is feasible to get this level of savings by the year 2000 using the new tools available and we believe that this goal is consistent with our ongoing commitment to

obtain as much economic electrical efficiency improvement as possible.

Q. All right. Now, Mr. Wilson, I am going to come back to you at the end to talk a little bit more about the kind of support that you could put in place for standards and mandation. But I think if this was a Monty Python show right now, I would say "and now for something completely different" because I want to turn to Mr. Harper and I want to have some discussion with him about the contribution that we spoke of a little bit earlier that time-of-use rates can make and dealing with at this time from the implementation, more the program side of those rates.

Just in starting out in this area, I would like you to clarify some of the terminology and outline the difference between wholesale and retail customers and customer rates.

MR. HARPER: A. Yes. If we look at page 67 of Exhibit 260, what we tried to illustrate here is the fact that Ontario Hydro is primarily a supplier of wholesale power; that is, if you turn to the left-hand side of the chart, we primarily generate and transmit power at high voltage levels to over 300 municipalities and private distributing companies in the province. These municipalities and private distributing companies

account for approximately 70 per cent of our sales.

They, in turn, take that power and distribute it to the end users within their franchise areas. The rates that we charge those municipalities and distributing companies we refer to as wholesale rates and those companies themselves as wholesale power customers.

Ontario Hydro's secondary role is as a retailer or a distributor itself to over 900,000 smaller customers and over 100 large industrial customers in the province. They are primarily located in areas not served by a municipality. In those cases, Hydro acts as both the wholesaler and the distributing company.

And in both cases, if we look at page 68, the types of customers that we serve are virtually the same. Both the municipalities and ourselves are serving residential customers, general service customers - that is small commercial/industrial customers - and customers over 5 megawatts. We call them direct customers; municipalities tend to refer to them as large users.

Also, in order to recognize the type of service area we have, we have separate rate classes to recognize both farms and seasonal dwellings.

Another thing I should point out is that our direct customers tend to be primarily large primary industry manufacturing customers; whereas, the municipalities, as well as having those types of industries, they also have a number of other large office buildings, universities and hospitals that they serve that are in excess of 5 megawatts. These end-use customers, be they served by us or by the municipal utilities, are referred to as retail customers and the rates we charge in both cases are referred to as retail rates.

Q. All right. Now, really by way of background, if you could give briefly a description of how the wholesale and retail rates are determined.

A. At the wholesale level - that is, Ontario Hydro's rates - really, the overall costs or revenue requirement that we have to recover are defined under statute by the Power Corporation Act, and that includes items such as operations, maintenance, administration, fuel, depreciation and provisions for certain reserves. It also includes as a result of recent statutory changes the cost of energy management programs.

After determining this overall level of revenue requirement, the rates are established for each

of our different classes at both the wholesale and at our own retail level in order to recover the costs of serving each of those classes of customers.

Similarly, municipal utility rates to their retail customers are set so as to recover the cost of the purchases of power they make from Ontario Hydro and also to cover local costs of distributing that power within their franchise areas. Again, the rates for each of those customer classes are set so as to recover the costs of serving that particular customer category.

Q. Now, against that background, can you tell us, please, the current status with respect to the implementation of time-of-use rates?

A. Time-of-use rates were implemented in Ontario in 1989 as part of an overall package of rate reform initiatives. The package had a number of elements. The first was a shift in our wholesale rate structure - that is the rate structure we used to charge those municipal utilities - to put emphasis on energy as opposed to demand charges.

...

[10:40 a.m.] The second was the introduction of time-of-use rates for all retail customers in the province over 5 megawatts. That's the large users served by the municipal utilities and the direct customers we serve. It also included the introduction of time-of-use billing on an optional basis for those municipal utilities themselves.

The package was reviewed by the Ontario Energy Board in 1988 and was implemented as a first step in 1989 after the Board issued its report. I should point out that both the Board and our customers in general supported the implementation.

The package also included a four-year implementation strategy whereby the time-of-use rates would be phased in so as to alleviate year-to-year bill impacts on customers, so effectively our 1992 rate proposal that we just finished discussing before the Ontario Energy Board completes the implementation of time-of-use rates.

Q. Perhaps you could briefly outline, please, Hydro's time-of-use rates structure.

A. As shown on page 69 of Exhibit 260, the time-of-use rates consist of two seasons. There is a summer season, April through September, and a higher priced winter period that covers the months of October

through March.

Similarly, as we show on page 70, within each month there is a peak and an off-peak period. The peak period extends from the hour of 7:00 a.m. to 11:00 p.m. during weekdays, not including statutory holidays. If you recall, this compares directly with Mr. Shalaby's testimony about what was considered to be our 16-hour peak period and the off-peak period is considered the balance of the hours in the month.

If you think about it and add the total numbers up, it results in roughly a 50/50 split between peak and off-peak hours within the month.

The energy rates that we set - and what we have set out here on page 71 of Exhibit 260 are the actual 1991 rates that we are charging our municipal utilities for supply at 115 KV service - are higher in the peak periods. You will notice the winter peak rate for energy is 3.35 cents as opposed to 2-3/4 cents in the winter off-peak period, and they are also higher in the winter than in the summertime.

Our demand charges, that's the amount we charge for the maximum amount used each month is higher in the winter than in the summer. And the important point to remember, both for the municipalities and for retail end-use customers, is that the demand charge

only applies to use in the peak period, so it is only your maximum demand in the peak period that that demand charge is applied to.

These peak/off-peak differentials and seasonal energy rate differentials generally reflect the difference in cost of service to our customers; and as a result, these time-of-use rates provide customers with a more accurate signal of what it actually costs us to provide them power during different periods. They also provide an incentive for customers to shift from the peak to the off-peak period, both in terms of the demand charge they face and also in terms of the difference in energy rates.

Q. Now you indicated earlier that time-of-use billing was optional for municipal utilities, and I would ask you to just give your experience to date in having utilities opt for time-of-use rates.

A. As of 1991 we have 195 of 313 municipal utilities who are being billed on time-of-use rates. However, I think it is important to point out that those 195 utilities represent close to 97 per cent of the total utility load we serve in the province.

Q. Now besides the large customers over 5 megawatts who have been on time-of-use rates since

1989, are there any other customers of either Hydro or the municipal utilities on time-of-use rates?

A. Yes. There are currently 34 municipal utilities in the province who have extended time-of-use rates to customers who have demands below 5 megawatts. While the application of these rates varies from utility to utility, typically the rates apply to customers in the 1 to 5 megawatt ranges.

Also varying across utilities is the question as to whether the rates are mandatory or optional. For 20 of the utilities the time-of-use rates have been implemented on a mandatory basis; whereas for the remaining, they are optional.

It is also worth noting that for 2 of these 34 utilities, they have introduced optional time-of-use rates to their residential customers.

As well as the utilities, time-of-use rates are now available on an optional basis within our own rural retail system to some 300 customers who have demands over 500 kilowatts. And to date some 24 customers have opted for the rate.

Q. Do you anticipate any more utilities implementing time-of-use rates for customers under 5 megawatts?

A. Yes. The 34 utilities offering

time-of-use rates this year is actually an increase from 16 utilities who were offering it in 1990.

Furthermore, we have seen a number of the utilities that introduced time-of-use rates to their smaller customers in 1990 have extended it even further down to even smaller customers still in 1991. And our indications from the field are is that this trend will likely continue into the future.

Q. Now have you observed any load shifting to date from those customers on time-of-use rates?

A. Yes. As you see from the discussion I had on interruptible power, we get individual meter readings on individual customers on an hourly basis. An analysis of our individual direct customer billing data has identified a number of customers who have shifted load from the peak to the off-peak period. In fact, some of the shifts have been quite dramatic.

As well, reports from our regional field staff identify activities by individual customers that they have undertaken in order to shift load from the peak to the off-peak periods. Overall we have identified some 116 megawatts of load shifting in 1989 and 1990.

Q. Now is that response to the

time-of-use rates as they have been brought in, has that been in line with what your original expectations were?

A. I am really not sure. The overall response to date is somewhat less than we had targetted for. However, we believe, at least in part, that can be attributed to the fact that we have a recession going on right now and industrial output and activity is generally less overall. And as a result, we believe it is a little bit too early to determine whether significantly more aggressive action is required in order to reach the 1000 megawatt target.

THE CHAIRMAN: Did I understand you to say that the 116 megawatts was for both 1989, 116 and --

MR. HARPER: Yes, it's cumulative.

THE CHAIRMAN: Oh, it's cumulative?

MR. HARPER: It was 62 megawatts in 1989 and 54 in 1990.

THE CHAIRMAN: So, it has been decreasing from '89 to '90.

MR. HARPER: No, the one adds on the other.

THE CHAIRMAN: I see. All right.

MR. HARPER: So, we had 62 the first year

and an additional 54 the second.

THE CHAIRMAN: All right.

MR. B. CAMPBELL: Q. Now, I would like to turn then briefly to interruptible service and perhaps --

THE CHAIRMAN: Just a moment. I don't want to leave it until I understand it. It was, you say, 62 in 1989 and 116 in 19 --

MR. HARPER: No.

THE CHAIRMAN: Well, if it is cumulative.

MR. HARPER: Right 62 in 1989.

THE CHAIRMAN: And 116 in 1990?

MR. HARPER: 54 in 1990. And if you add those two together, that gives you a cumulative amount of 116.

THE CHAIRMAN: Okay.

MR. B. CAMPBELL: So, if I understand it --

MR. HARPER: So, by the end of 1990 we have seen a total of 116 megawatts.

THE CHAIRMAN: All right. But that is a decrease then in 1990 over 1989; is that not right?

MR. HARPER: The rate of increase is slower.

THE CHAIRMAN: Yes.

MR. B. CAMPBELL: Q. So, you captured 62 megawatts in 1989 and you captured an additional 54 megawatts in 1990.

MR. HARPER: A. That's right.

Q. And those would be consistent with what you indicated in terms of it being in line with your original expectations?

A. I think if you look at Exhibit 76 it reported the 62 megawatts as an actual for 1989 and actually had an expection for 1990 of 77 megawatts, so the 54 is less than what we had expected for that year.

Q. For the reasons that you gave?

A. Yes.

Q. Now if I can then, I would like to turn to interruptible service. I understand you have made some recent changes in this area as well and there was a little bit of discussion earlier about capacity interruptible and discount demand service.

I would like you to start by giving an outline of the circumstances that led up to the change to discount demand service.

A. Through the early to mid-1980s when Hydro was in a surplus capacity situation, interruptible service or this peak clipping option was offered in the form of what we called capacity

interruptible power. The discount was based on the cost of demothballing or essentially returning to service surplus generation that we had at that point in time.

However, by the late 1980s the situation was changing. And, in fact, in 1988 the interruptions to our interruptible customers reached the 20-year high of 50 hours for that particular year.

Then in the following year, 1989, cuts to interruptible customers totalled some 150 hours, primarily as a result of problems we had in December of 1989. These increased interruptions in 1988 and 1989 led a number of our interruptible customers to re-assess their contracts and to request a conversion of part or all of their interruptible contract to firm service.

At the same time, the Ontario Energy Board in its review of our 1990 rates - that would have taken place during 1989 - recommended that interruptible rates be reviewed and that the discount be set commensurate with the system benefits arising from having interruptible power in place.

In 1990 we presented a proposal to the OEB for a new form of interruptible service called "Discount Demand Service". The purpose for changing

the name was to signal a number of changes we were making to our interruptible service.

The first was to increase the discount to a higher level commensurate with the system benefits. The second was to increase the number of options we were offering to customers to give them some choice in the terms and conditions they faced. And the third was to change the terms and conditions somewhat to match the current system requirements.

Following the release of the Ontario Energy Board report last August, interruptible power was replaced by discount demand service January 1 of this year.

Q. What has your success to date been with this new rate form that you referred to as discount demand service?

A. Since January all but three customers representing some 19 megawatts of contract have converted to the new discount demand service. Also, two customers who had previously converted to firm service have recontracted for interruptible service and we have signed up two new customers as well. In total, these four customers that we have added represent some 70 megawatts of contract.

And as I indicated earlier, current

contracts currently total some 1,026 megawatts which represent about 525 megawatts relief from our customer.

Q. Now what are you doing to ensure that customers know about the potential opportunities available to them through discount demand service?

A. Interruptible service is fairly complex and it's something that is best marketed to customers on a direct contact basis, where the benefits to the customers and the actual requirements of the customer can be fully explained. To this end, discount demand service has been included in the package of programs that our regional field staff take out and discuss with customers when they are going through energy management programs with them.

Q. Now, the time-of-use rate initiatives and the discount demand service, how did those rate initiatives compare with the kinds of steps that are being taken by other utilities in the area of demand management?

A. A survey we recently undertook of other North American utilities who are fairly active in demand management, the results of which are recorted in response to Interrogatory 4.26.16.

MR. B. CAMPBELL: That would be item No. 6, Mr. Chairman. 4.26.16, item 6, to be added to

Exhibit 261.

---EXHIBIT 261.6: Interrogatory No. 4.26.16.

THE CHAIRMAN: Thank you.

MR. HARPER: This survey indicates that time-of-use rates and interruptible rates are the main initiatives pursued by other utilities who are interested in demand management.

MR. B. CAMPBELL: Q. And are there any other rate-related initiatives that you are working on that could affect Hydro's demand management results?

MR. HARPER: A. Yes, there are two initiatives at this time. The first is residential rate restructuring and the second is time-of-use rates for residential and smaller general service customers.

Q. What does the residential rate restructuring that you are considering entail?

A. With respect to the residential rate restructuring, we filed a number of interrogatory responses, particularly 4.12.112, outlining what we are considering in this area.

MR. B. CAMPBELL: And that 4.12.112 would be No. 7 in Exhibit 261, I believe.

---EXHIBIT NO. 261.7: Interrogatory No. 4.12.112.

MR. HARPER: However, just to give you an overview, we are addressing the perception that our

current declining block rate structure that we use for residential and smaller general service customers encourages consumption. Our current proposal calls for the introduction of a service charge and a single flat energy rate for all use, for both our retail customers and the retail customers served by the municipal utilities. Such an approach would be consistent with that used by most of the utilities we surveyed in the survey I mentioned earlier.

The proposal for our own retail system also includes a revision to the actual customers' billing statements so they will be able to see more clearly exactly how their bill is calculated and understand how changes in the consumption will affect their bill.

MS. PATTERSON: Can we go back. Did you say flat--

MR. HARPER: Yes.

MS. PATTERSON: --billing to residential customers would be a new initiative?

MR. HARPER: Yes.

MS. PATTERSON: What's the advantage of that?

MR. HARPER: Well, as I said earlier, currently we have a declining block rate structure

where for the first 250 kilowatt hours there is a high rate in the balancing.

The reaction we have gotten from many of our customers is the perception that that's encouraging them to use electricity and that's the message we are trying to get through to them.

...

[10:45 a.m.] Our view is that moving to this alternate rate structure, we will be eliminating that perception on the part of our customers.

MS. PATTERSON: But the billing isn't based on actual use. It is still based on a block rate?

MR. HARPER: I am sorry, when you say "based on actual use", we bill our customers based on the kilowatthours they actually use.

MS. PATTERSON: Right.

MR. HARPER: So I didn't understand --

MS. PATTERSON: But I thought you said you were using a flat rate?

MR. HARPER: Oh, I was just trying to -- when I said 'a single energy rate', I was just trying to characterize it as a flat rate. I am sorry, I was --

MS. PATTERSON: Thank you.

MR. HARPER: It has no connotation of flat rate in the sense that flat rate water heaters there's -- that is something totally different. If that is the mental image it created, I am sorry.

MR. B. CAMPBELL: Q. It is a single rate per unit of energy for each and every unit of energy?

MR. HARPER: A. Yes.

Q. All right. Now, if I can turn then to the other item you mentioned, which, in the area of rate-related initiatives. I would ask you to briefly describe what you are doing in the area of time-of-use rates.

A. In this area we have activities going on on two fronts: They are aimed at ensuring that the option of extending time-of-use rates to smaller customers is available if required.

The type of meter currently used to bill large industrial customers for time-of-use costs roughly $5,000. Such costs represents not only a financial barrier to a utility that is interested in implementing time-of-use rates for smaller customers, but it also significantly impacts the economics of a time-of-use rate program for those smaller customers.

We are currently working with meter manufacturers to ensure they are aware of our requirements in this area and to determine what products are available and their likely cost.

Our initial focus is on suitable meters for those smaller general service and industrial customers that would require time-of-use billing for both demand and energy. And then we will turn our focus to ensuring that there are time-of-use meters in

place for energy-only customers such as very small commercial customers and residential customers.

In the area of time-of-use rates itself, we are wrapping up the load impact phase of our residential time-of-use rate experiment and we filed a report as part of Interrogatory 4.7.144.

MR. B. CAMPBELL: Just a minute. It is 4.7.144 would be No. 8 in Exhibit 261, okay?

---EXHIBIT NO. 261.8: Interrogatory No. 4.7.144

MR. HARPER: This report outlines our preliminary findings which were the basis for the comments I made yesterday about the fact that it looks like time-of-use rates may only be cost justified to residential customers if they have both space and water heating.

We have also been undertaking time-of-use rate experiments for small commercial customers and our first analytical results on those are expected later this year; however, we have been surveys of the customers on a qualitative basis and the response to date is less positive than for our residential customers.

MR. B. CAMPBELL: Q. Now, do you also watch or keep track of the different rate forms that are used by other utilities?

MR. HARPER: A. Yes, we do. We keep track of them and look at them further if it seems something interesting is going on elsewhere.

By way of an example, we have just started looking at the possibility of experimenting with real-time pricing in order to test its administrative feasibility and its potential for customer response.

Real-time pricing is really an extension of time-of-use where you tell customers on a more short-term basis what is expected to be the cost of electricity, say the next day or the next week, on an hour-by-hour basis. It clearly allows the utility to reflect its own costs more directly to customers. And at the same time, it gives customers the opportunity to shift loads in a way that time-of-use rates does not and, therefore, reduce their electricity bills.

Q. All right. Now, with that background of the programs and the kinds of things you are looking at on the rates side, I want to turn back to you then, Mr. Wilson, and start just briefly with you and then turn to Ms. Fraser on the matter of your overall approach in delivering electricity efficiency programs.

We have discussed opportunities for various alternatives for achieving demand management

results and I would like you to briefly address, please, an overview of Hydro's strategy for delivery of electricity efficiency programs.

MR. WILSON: A. Hydro's strategy for demand management delivery has got six major points, and Ms. Fraser will outline for you how these get applied in particular instances.

But first and foremost, our strategy is leverage. That means that we work in partnership with everyone who can help us meet our goals. We will build on the strengths that we have to create opportunities to help others to profit and enjoy success by working with us and get demand management results.

Closely related to that is a notion that we will share the benefits. We are going to share benefits of the results of demand management with all the contributors to success. Manufacturers of energy efficient products will gain market advantage. Governments that support energy efficiency should gain public approval. Customers that take part in demand management programs should enjoy lower electricity bills. So, if this works the way we think it has to work, then everyone has to gain something from it.

Now, the third underscores the point we have been making since we started talking to you

yesterday, that we are going to fast-track the whole exercise. We have seen a major change in our approach to fuel switching and use of standards over the last month and a half and that characterizes our willingness and our ability to move quickly to take good ideas and build them into our portfolio of programs.

The fourth point is that we intend to maximize the use of all the marketing tools that we have available to us. We have two new tools available and as you have heard, we are going to be building those this in. Those will be added to the things we are doing now with incentives, with energy audits, with pricing that Mr. Harper has described, with energy efficient standards with information and communication campaigns.

The fifth point is that we are going to be as tedious perhaps with the public - as we may have been to some of you here today and yesterday - is that we are going to continue to reinforce the need for action. We are going to beat the tom-toms until everyone is sick of hearing how important it is to improve energy efficiency both among our allies and throughout Ontario.

And finally, and certainly not least, we are going to endeavor to design our demand management

programs to sustain the quality of the natural and economic environment in Ontario by creating long-lasting efficiency improvements that reduce the environmental effects of electricity supply and by ensuring that the demand management measures themselves are environmentally sound.

Q. All right. Now, what kind of steps is Hydro prepared to take in support of this overall strategy?

A. Well, we use our provincial mandate to put pressure on those responsible for product standards and codes to raise these standards to a aggressive levels.

We have an outstanding research capability within Ontario Hydro and we will use that to support efficient product development and the testing of new products.

We will use our buying power to contribute to a market for best technology and so support the movement to higher standards.

We will assess the role that we can play to support the retooling and upgrading of manufacturing capability in Ontario to bring energy-efficient products to market more quickly.

And we will use our province-wide network

of experienced customer energy service staff to sell demand management to support ally development and promote widespread community level involvement.

And finally, we will capitalize on the confidence that our customers have in us in our technical capabilities by providing them with the security blanket, assurance, that they need to try these new energy-efficient products.

Q. Now, Ms. Fraser, against that kind of strategic overview, I would like to turn to you. Earlier we heard Mr. Burke describe the economic potential for demand management that exists in Ontario.

And I guess when you get down to the level of a program strategy, my first question to you is one that has always seemed to me relatively simple and I guess I have been thought that it is not and it is simply this: That if all of these measures are economic, why aren't they simply being installed by your customers?

MS. FRASER: A. Well, as Mr. Burke pointed out, these measures are economic from the total customer perspective; however, individual customers don't make their decisions on that basis. In reality, there are market and institutional barriers which prevent customers from adopting these cost-effective

energy saving technologies.

Amoury Lovins, the head of the Rocky Mountain Institute, has pointed out:

> "There are a myriad of outmoded laws, rules, customs and habits left over from the cheap energy era which now restrict people's ability to choose the best buys."

Demand management programs, which are designed using the total customer perspective, can increase the adoption of energy saving measures.

As a program designer, my job is to identify and, where we can, remove these barriers and where we can't remove them, find a way to go around them over over them.

Q. And what kinds of barriers have you identified to the adoption of these programs in Ontario?

A. The one that gets a lot of attention is called "the payback gap". It arises when the time it takes to recover the added costs of the energy saving measure through the savings on the energy bill is longer than the customer is willing to wait.

Of course, different customers have different payback criteria. Some customers won't look

at anything longer than a year; others consider up to three years acceptable.

In our street lighting pilot program, the average payback without our incentives was almost 12 years. There is no one magic number.

The sector where the issue of payback is the most straightforward seems to be the industrial sector. Short payback projects are implemented almost as a matter of course if there was no perceived risk to the production schedule.

But longer payback items must compete with the firm's other uses of its capital. That is why Hydro offers the accelerated payback program which provides incentives to bring the payback down to one and a half years.

But the payback barrier is not the only one. In fact, while removing the financial barrier is a necessary condition for successful demand management programs, it is not a sufficient one. There are other barriers which must be considered and they are listed here on page 73 of Exhibit 260: Lowest first cost, issue of who pays versus who benefits, a lack of awareness, the lack of available product or service, and technical risk.

Q. I am going to ask you to go through

each of these in turn and start please with lowest first cost.

A. Well, as I am most familiar with the commercial market, I will illustrate it with a commercial building example. And let's say this office building that we are in here was originally built by a developer who intended to sell it as soon as it was completed, and that is a common way in which building development is done.

The developer would have an architect design the building and then have mechanical and electrical consulting engineers design the heating and cooling and lighting systems. The developer would be very clear about wanting a building that would be easy to find a buyer for. Features such as access to the subway, marble entrance ways, high-speed elevators and flexible floorspace would be high priorities.

However, the developer would have no financial interest to invest in energy efficient systems or equipment that cost more up-front even if they do result in long-term operating savings.

Future utility costs, gas or electric, figure very little, if at all, in the attractiveness of a building to future owners because such costs are usually passed on to tenants. And this brings me to

the second barrier, who pays versus who benefits?

Q. All right. And perhaps you could explain how that works.

A. Well, let's say that the developer then sold this building to a property management firm who rents it out to tenants like the Environmental Assessment Board or IPPSO or Ontario Hydro; the most likely arrangement for the payment of utility bills is to allocate the total bill across all the tenants based on the amount of space that they occupy.

The property management firm has no incentive, for example, to install a more efficient lighting system because it can pass the electricity bills through to the tenants and it does not receive the benefit of the savings itself.

...

[11:10 a.m] Similarly, the individual tenants, even if they have long-term leases, have no incentive to retrofit lighting system within their own space because only a portion of the savings would return to them, lengthening the payback. The rest would be enjoyed by the other tenants who had done nothing to save energy.

Q. All right. Now with that, let's turn to the next item which is lack of awareness.

A. Well, let's change the scenario somewhat and assume that the building was sold to a company who owned and occupied it themselves, so that the benefits of any improved energy efficiency would accrue to the same bottom line that was affected by the investment.

But even in this case, that firm might not be aware of the increasing number of options to improve electrical efficiency or that such upfront expenditures on a more efficient option can return significant financial benefits.

Let's use lighting as an example. When you or I purchase light bulbs at the grocery store, or when purchasing departments order lights to replenish the maintenance inventory of fluorescent tubes, it is usually the cost of the light bulbs or the tubes that's considered rather than the total life cycle cost of

lighting. This is illustrated here on page 74 of Exhibit 260.

Very few people realize that only four cents out of every dollar a commercial landlord spends on lighting goes to the purchase of the light bulb. Maintenance takes 8 cents and 88 cents goes to the utility company.

Without knowing this, the supposedly cost conscience purchasing department orders standard 40 watt fluorescent tubes to save 30 cents over the cost of the energy saving 30 watt tubes on a per tube basis. However, they end up losing $1.25 over the life of the lamp. A building like Hydro Place, for example, which has 60,000 energy saving fluorescent tubes in place has seen substantial savings.

Q. What then about the item of technical risk?

A. Technical risk can be real or perceived. In many cases the more efficient products have a much shorter track record than the status quo products which most of the market is more comfortable and more familiar.

Let me stick to the same example: energy saving 34 watt fluorescent tubes. When these first came on the market they had relatively high failure

rates compared to their standard 40 watt counterpart. There were some problems in product quality and compatibility with ballasts. These have been overcome, but once burnt twice shy.

And that brings me to the last barrier.

Q. That I think was product availability?

A. Yes.

Q. If the product is not available either because of product shortages or the fact that the distributors don't stock the products they don't think there is a market for, the customer can't buy it even if we have got them past all the other barriers and they are willing to invest in energy efficiency.

In Northwestern Ontario, the episode with the early failures of the 34 watt tubes was so severe that distributors refused to stock them and have shown little interest in stocking any of the newer, more advanced lighting technologies.

Q. Now, obviously, what you have described is a somewhat complex environment in which energy decisions are made. How do you go about gaining the information about that environment that you need to design programs?

A. Well, we do this in three ways.

First of all, we do a lot of market research to help us segment the market, to determine attitudes about technologies, and to understand customer preferences and needs, and to monitor program effectiveness.

We make a considerable investment in market research and this is shown in our registry of customer research which was filed in response to Interrogatory 4.7.20.

MR. B. CAMPBELL: And that number would be No. 9 then, Mr. Chairman, on Exhibit 261.

---EXHIBIT NO. 261.9: Interrogatory No. 4.7.20.

THE CHAIRMAN: Thank you.

MS. FRASER: And actually a lot of the actual research reports are filed in Part 3 of the program concept reference document.

MR. B. CAMPBELL: Q. And I gather all that information is available in the Board's reading of it?

MS. FRASER: A. Yes, it is quite extensive.

Secondly, we gather information from our customers and market allies directly. Technical staff, our program staff, and our field staff all interact with them on various aspects of energy management.

We participate in customer, trade and

business associations to encourage information exchange and to build trust among the players in the industry.

And third and finally, we use program tests. Pilot projects are useful in helping to design full scale programs so we can get the bugs out before they go province-wide.

We also test alternative ways to implement programs and verify engineering estimates of savings from specific technologies.

Q. Now in designing programs to overcome some of the barriers you have described earlier, does it make a difference to you as to how the decisions are made and exactly who makes the decisions on this various equipment? You how do you deal with that question?

A. Well, it is critical.

Although it's the customers who pay the electricity bill and it's the consumers who turn the light switch on, it is the decision makers who choose the energy-using equipment. In very few cases are the customer, the consumer, and the decision maker all the same. Even in the industrial sector, where the company pays the bills, uses the energy, and makes the decisions about what equipment it buys, more than likely the energy bill doesn't go anywhere except to

accounts payable. And decisions about energy use and energy-using equipments are made with production as a first priority. Energy costs usually represent a very small portion of costs.

In the commercial sector, as my first example of the office building showed, the bill payer, the consumer, and the decision maker are all different companies. Even government-owned buildings are subject to this fracturing of the decision-making process.

Takes schools for example. The provincial Ministry of Education pays the capital construction cost on a per student basis. And there usually isn't room for many energy efficient features if they have to be traded off against classrooms, library facilities and gymnasiums.

The operating costs, including the electricity bill, is paid by local taxes. While more efficient lights or motors would reduce those bills, such investments have to compete with teachers' salaries and more books for the library. Each marketplace is different and these differences have to be considered in our program design.

Q. And how does Hydro go about accommodating these differences in the real world marketplace?

A. First of all, we break the marketplace down into four major groups that we call sectors: commercial, industrial, residential, and agricultural. And Mr. Burke spoke yesterday about the potential in each of those sectors.

But within those sectors, for programming purposes we further segment to focus on customer groups which have similar needs and characteristics. We then develop programs to essentially market energy management to the critical decision makers and to the people who influence the decision makers.

Q. We have spoken a bit of the decision makers themselves. Who are the people who you see as being a primary influence on the decision makers and how do you work with them?

A. Well, really, they are all the other players in the energy marketplace. They are either allies or potential allies, hope-to-be-soon allies. They may vary from sector to sector and from product to product, but we want to develop partnerships with all of them.

In addition to all the levels of government and in municipal utilities, these allies include manufacturers, distributors, retailers, contractors, consulting engineers, developers,

builders, building managers, architects and so on. It is also critical to work with the trade and professional associations which represent them. These include the Canadian Distributors' Association, the Illuminating Engineering Society, the Consulting Engineers of Ontario and many others.

In addition, we work with associations which represent various customer groups, such as the Pulp and Paper Association, the Building Owners and Managers Association, the Ontario Association of School Board Officials, to both increase their awareness of energy efficiency and to get input and feedback on our programs.

Sometimes these allies have both the skills and self-interest to play a positive role in our demand management programs. In other cases, part of the program design has to include motivating the allies to support the program; and in some cases, providing them with the skills required for the task.

We often have to develop programs to get allies on board at the same time or even before we develop the customer programs.

We work with manufacturers and distributors to encourage them to produce and stock more efficient products; for example, our pilot program

for high efficiency motors that we ran in 1987/1988, showed us the fact that very few distributors stocked high efficiency motors. And this accounted for the very low penetration in the replacement market because in this market, a new motor is purchased when the old one breaks down and the maintenance department hasn't got time to do a special order; they need it right away. So, whatever is on the shelf is bought.

As a result, we included a distributor incentive in the high efficiency motor program when it went province wide to encourage distributors to stock high efficiency models. And this is working.

Q. Now, you have mentioned the municipal utilities. Where do they fit in all of this?

A. The over 300 municipal utilities are a critical link to the energy consumers in Ontario. Like Hydro's area offices, they are the first line of contact with customers. They understand and appreciate local differences in conditions that might affect the uptakes of the programs.

However, there is a great diversity among the utilities. The 30 largest utilities account for about 80 per cent of utility sales. Some utilities are very small with less than 200 customers; some utilities are facing distribution constraints; others would like

an increased customer base over which to spread their costs; some are very proactive, customer-oriented marketing organizations; some just don't have the resources to offer related customer services.

Q. What role do those utilities play, that is, municipal utilities generally, play in demand management?

A. Well, as a result of this diversity among the utilities, their role is also diverse and it varies among the sectors. In most cases, the residential customers are also the constituency of elected utility commissions and as a result they focus more attention on the residential customers and on Hydro's residential programs.

On the other hand, most utilities are quite comfortable in relying on Ontario Hydro to deal with the more technical energy efficiency challenges facing their commercial and industrial customers as long as they are involved or at least informed.

We have recently decentralized our field staff so they could be closer to the utilities and the customers. Some of them have negotiated joint energy management plans with utilities which detail the respective roles and responsibilities in the implementation of demand management. I expect that

this will expand in the future.

Q. And what about the program development phase? Do municipal utilities get involved in reviewing the design of programs that they helped to implement.

A. Our field staff gather input from utility staff and in turn provide feedback to program development staff. Hydro is currently working out more detailed roles and responsibilities with the larger utilities who wish to get even more involved in program design. In addition, I am one of two Hydro representatives on the Municipal Electric Association's demand management committee which provides input on Hydro's programs.

As Hydro's resource planning relies more and more on demand management and we look to fuel substitution and more aggressive standards to contribute to demand management, co-operation with municipal utilities becomes even more important.

We already know that some municipal utilities are concerned about the impact of fuel switching and will have a lot of work to do to address these concerns. Nevertheless, we expect that the large municipal utilities will play a significant role in delivering demand management programs. Many of the

smaller municipal utilities, however, we expect, will continue to rely on Ontario Hydro to deliver programs to their customers.

Q. Now, you have discussed somewhat the marketplace barriers that you have to consider in program design and some of the marketplace dynamics that you also have to take into account. Are there any other things that you look at when you are getting right down to putting together an outline of a program that you want to consider?

A. Yes. Before we design a demand management program, we screen the concept. This is illustrated on page 75 of Exhibit 260. All of the concepts that we have screened to date are included in the program concept reference document.

At this stage we evaluate the technical feasibility, the marketplace considerations, the environmental impacts, and the cost/benefit of the concept. If it is not technically feasible or cost effective, we will not proceed with program design.

We look at marketplace considerations to determine if ally or product development work is required before the program could be launched.

...

[11:25 a.m.] Environmental impacts are also assessed at this time.

Q. What are the kind of environmental concerns that you consider? They have been mentioned a couple of times now.

A. Well, as Mr. Shalaby pointed out, demand management has favourable impacts on the environment overall, reducing the need for new generation, transmission and distribution facilities and reducing the use of coal, but there are some environmental concerns to be addressed specifically in programs.

For example, fluorescent ballasts, produced before 1979 contain PCBs and must be handled according to the Ministry of Environment's guidelines.

Early scrapping of inefficient equipment could increase our solid waste disposal problem. Disposal of inefficient refrigerators has to include proper recovery of the CFCs.

In the conservation days of the 1970s, a lot of buildings and homes were sealed up to the point where air quality became a major issue. The Sick Building Syndrome, as it is now known, resulted in the association of heating, refrigeration and air-conditioning engineers, tripling the required air

changes for a commercial building. This, in turn, resulted in increased energy consumption, not less.

We have to be sure we can avoid problems like this and we do so by looking at them up front.

Q. All right. I would ask you then against that background to briefly describe how you design programs and what considerations, and how you deal with these various considerations when you are undertaking that exercise.

A. Well, program design is really figuring out the right mix of elements which will overcome these barriers, motivate decision-makers to invest in demand management measures and energize the allies to make it happen, to help make it happen.

As Mr. Wilson has pointed out, the proposed changes to the Power Corporation Act have broadened the range of elements that we can consider.

Possible elements of a program include - and bear with me because this is a bit of a long list - helping customers identify opportunities to save energy through aduits or metering specific end uses, providing customers and allies with technical and financial information, providing customers with technical assistance either directly or paying for the assistance of consulting engineers and others, installing energy

efficiency equipment right on the customer's premises or hiring contractors to do so, training customers and allies as well as our own staff and municipal utility staff, providing incentives to customers to address the payback gap that I spoke of earlier or to allies to secure their participation in programs, doing advertising to increase awareness and identify customer benefits, product development to address technical risk or product availability, ally development to expand the distribution channel for energy-efficient products, developing standards to be used as a basis either for government regulation or for paying incentives, and finally, determining if the end use is better served by an alternative fuel such as gas.

These elements have to be effectively combined in a package that makes sense to the customers and the allies, and then this package has to be effectively communicated to the marketplace.

Now, we know that we can't design the perfect program in the ivory tower at head office. All of our programs have been designed to provide as much flexibility as we need to address the dynamics in the marketplace and we have implemented those programs with the knowledge that we would have to fine tune them as we gain experience.

MR. B. CAMPBELL: Mr. Chairman, I think if we were looking for a place for the morning break, this is as good a place as we are going to find.

THE CHAIRMAN: All right. Mr. Campbell, we will break for 15 minutes.

---Recess at 11:30 a.m.

---On resuming at 11:49 a.m.

THE CHAIRMAN: Be seated, please.

MR. B. CAMPBELL: Thank you, Mr. Chairman.

Q. Now, I would like to continue with you, Ms. Fraser, and you have indicated that these various program elements have to be combined in a package that makes some sense.

And how do you determine what makes sense?

MS. FRASER: A. Well, in the final analysis, this requires a judgment of program designers, but we don't do it in isolation and we employ a number of financial tests to help us assist in program design.

When we develop programs, we try and get input from a wide range of perspectivies; for example, when we developed the energy efficient lighting program, in addition to the formal market research and

technical studies, we directly consulted with lighting manufacturers, distributors, contractors and customers to review program alternatives, potential incentive levels and issues such as quality control. This helped us to test our assumptions and our analysis.

Q. Now, what are these analytic tests that you use in program design? I take it they would be similar, if applied at somewhat different levels, as the ones that Mr. Shalaby spoke to?

A. Yes. There are five different tests which assess the cost and benefits from different perspectives. The first test, the total customer cost test, is the same one that Mr. Shalaby described earlier, as you said, and the one that Mr. Burke used to determine if demand management measures were economic. In program design, we use this test to tell us if the program itself is economic.

Often, programs include a bundle of measures and very specific program delivery costs. So we, again, compare these costs to the benefits of the program from the total customer perspective.

For purely practical reasons, we may include measures and programs which did not pass the screen on their own.

Conversely, a particular program design may result in delivery costs that are so much higher than the average that Mr. Burke used that it is not economic to do it in that way.

THE CHAIRMAN: I may have misunderstood. I thought it was said that if you don't pass the total customer cost test, that is the end of it; is that not right?

MS. FRASER: Well, for example, when we designed the energy efficient lighting program, the measure that Mr. Shalaby indicated yesterday, T8 lamps in religious buildings didn't pass; however --

THE CHAIRMAN: So it is just the total customer cost test, I think. I have to look it up.

MR. B. CAMPBELL: No, I think the example the T8 and the religious buildings did not pass.

THE CHAIRMAN: That's right, it didn't pass.

MR. B. CAMPBELL: And here we were talking about in calculating the potential and screening the programs included in the potential.

Q. And I think, Ms. Fraser, if you could address that same -- maybe use that same example as to how you treat that at a program level.

MS. FRASER: A. Well, exactly. I think

we will look pretty funny if we designed an energy efficient lighting program and had in the fine print, this does not apply to religious buildings.

THE CHAIRMAN: No. I just want to make sure that I understand it. If the TCC test is failed, is that the end of it?

MS. FRASER: No. There are some practical considerations that we take into account in program design that may actually put a measure back into the bundle that we look at.

THE CHAIRMAN: Well, Mr. Shalaby gave me the impression that that was the first hurdle that had to be jumped and that then you went into the program design mode and put all these other matters together, but if you didn't pass the TCC test, you were out; is that wrong or is that right?

MS. FRASER: Well, it is not included in the potential numbers that Mr. Burke indicated. So from a potential point of view, it is not included.

MR. B. CAMPBELL: And I think it is a fair -- I think we wouldn't dispute that that was thrust of Mr. Shalaby's evidence.

Q. What I am asking Ms. Fraser to address is, when they finally get right down to putting together a program that is for T8 lights with

electronic ballasts, I think what Ms. Fraser has explained is simply the point that if a religious building wants to make energy savings even if they are not economic for them to do so perhaps, but if they wanted to do it, they aren't excluded by the programs.

MS. FRASER: A. Well, actually, what usually happens in this situation is that the savings that do get made if a religious building wants to take advantage of our program is that the lighting is probably used in a different way than which was considered in the abstract or the theoretical way.

For instance, the operating hours for a church was considered to be very short; however, some churches are used for much longer periods of time during the week. Some are used for day care; some of used for bingo; some of used for all sorts of things. And as a result of that, it becomes economic.

So, when we look at the program, we have to be pretty practical about what is included and what is excluded. So something, you know, as very particular as that example that was used by Mr. Shalaby, when we actually get down to looking at what it means when we take it to the marketplace on the street, we have to, you know, add a little common sense, I guess, to the equation. And that is what

would happen in a situation where it is something like that.

In other situations, where something, you know, right across the board is not economic no matter how many hours it operated or anything else, then certainly what Mr. Shalaby indicated would be the case and we wouldn't include it. But these are just purely a practical consideration as opposed to an economic one.

THE CHAIRMAN: Okay.

MS. PATTERSON: If you were, for example, discussing energy saving in a church, would you help the customer analyse their potential for cost savings?

MS. FRASER: Absolutely, yes. That is exactly what our field staff do, is go and help them do that calculation.

MS. PATTERSON: Thank you.

MR. B. CAMPBELL: Q. All right. Now you can just pick up on this example.

MS. FRASER: A. Sure. Okay, the second and third tests that we use are the rate impact tests. And again, they were described earlier. And what we do here is determine the impact of the program on both the wholesale and retail rates.

While these tests are not hurdle tests

like the total customer cost test, alternative program designs may have different rate impacts. And all things being equal, we would minimize the rate impacts; for example, if two alternative program designs would get the same megawatt results, we would obviously choose the one that had the lesser impacts on rates.

The fourth test is the utility cost test. This looks at the program costs and benefits purely from Ontario Hydro's perspective. Again, all things being equal and we achieve the same megawatt results, we would maximize the benefit to Hydro.

The final test is the participant cost test. This looks at the cost and benefits from the program participants' perspective. Obviously, if the participants will not receive any benefit, we can't expect to achieve much penetration of our program so we go back and take another look.

As I said, we use these financial tests to assess alternative program designs from the various perspectives that may be revolved in the program.

Q. All right. Now, I want to turn then to the incentive level portion of your program design, and while there are some specific issues with respect to incentives that I am going to ask you to come back to toward the end of our direct testimony, could you

tell us briefly now how you go about determining incentives?

A. Well, there is no magic formula for that either. The demand/supply strategy and appendix 4 of Exhibit 3 provides some overall guidance in setting incentive levels. It is really more of an art than a science and it is something that Hydro, like all utilities involved in demand management, is still learning about.

Usually, demand management measures involve premium products that have premium prices. Incentives can reduce the impact of those higher prices. Determining how much requires an examination of specific factors on a program-by-program basis, including the specific market barriers that I talked about earlier, the costs and savings of the measure and an assessment of what it will take to move the market.

We look at incentive levels of other utilities, other programs, as well as results of our pilot programs.

Q. All right. And do you consider cost effectiveness when you are worrying about incentive levels?

A. Yes, we do. Obviously, we don't want to pay more than necessary. That would be a waste of

money.

We design programs so that as much as practical we avoid paying customers for doing something they would have done anyway. In demand management jargon, these are called free riders. And obviously for cost-effective reasons, we design our programs to minimize these free riders.

For example, our new guaranteed energy performance program was explicitly designed to expand what energy service companies do normally.

Q. All right. Now, what is it that energy service companies do normally?

A. Well, energy service companies invest in and implement energy saving projects in their clients' premises. They recover their costs and make their profits from the utility bill savings that result from the energy savings. This is also referred to as shared savings or performance contracting.

Traditionally, these companies have focused on switching oil-fired boilers to gas and training building operations staff.

On the electrical side, they often did a lot of low cost or no cost housekeeping items but did not invest in electrical efficiency improvements which had a payback that was longer than the usual term of

their contracts.

Our program provides incentives to the energy service companies to include more costly and higher yielding electricity-saving projects in their performance contracts.

We have put our incentives on a sliding scale to make it more attractive for them to invest in longer-paying products and equipment which will deliver more and longer lasting savings.

...

[11:00 a.m.] Q. Now are there programs where you really haven't had to worry about it from a program design point of view in order to address this free riders issue.

A. Well, yes. The high efficiency motor program is an example. Based on the results of the pilot program that I spoke of a few minutes ago, we made the judgment that without our program and in particular without the distributor incentive, penetration of high efficiency motors would not increase naturally. Therefore, we felt we didn't have to include a mechanism to avoid paying for free riders.

Q. Now against that background of program design considerations, can you describe what particular program strategies you are pursuing to put your demand management plan into action.

A. We are really doing two things at one right now. We are implementing demand management programs with customers and we are helping to build the necessary demand management infrastructure in Ontario.

Q. What types of customer programs do you currently have?

A. Currently we are pursuing a menu of programs so that all customers will have an opportunity to take advantage of at least one. Our current

customer program mix includes five different types of programs: audits, promotional programs, technical information and assistance, incentives, and finally, direct installation programs where Hydro undertakes to implement the demand management measure for the customer.

Currently, this mix includes a strong use of mass marketing campaigns such as coupon campaigns with major retailers to increase consumer awareness of energy-saving opportunities and to help customers do so.

Even though these mass media campaigns have a strong residential flavour, we find they also increase awareness among the commercial and industrial business people.

In the commercial/industrial sectors, we are pursuing targeted approaches to large customers and we are recognizing that office buildings have different energy needs than retail stores and that chemical plants are different from auto plants. Here we use successes with one customer to help us sell others. We use case studies and testimonials.

In news letters, trade advertising, sales presentations, we showcase successful projects in similar businesses. When companies see that their

competitors are gaining even a slight advantage with a new technology or a system, they are more interested in adopting it themselves.

Q. Now you have also mentioned that you are pursuing programs which would expand the infrastructure you need to implement demand management. Can you tell the Board something about these efforts?

A. Well, as Mr. Wilson pointed out, Hydro can't implement demand management alone. We need to mobilize all of the allies and we do this in a number of ways. Let me explain using the lighting industry as an example. As I mentioned earlier, when we were developing the energy efficient lighting program, we consulted with manufacturers, distributors, and contractors to get their suggestions on how best to design a program and to understand how the lighting industry worked.

We learned that it was basically an order-taking business, lots of competition on price but little value added when it came to sales, particularly with respect to high efficiency products.

By working with the lighting industry before the program was developed, they were better able to understand what we were doing and why. Contractors in particular were quick to see the business

opportunities which were created when we began paying incentives for lighting retrofits in January of 1989.

But we have also seen manufacturers like Sylvania totally revamp their marketing strategies to feature energy efficient products and to expand their service arm to sell energy efficient products using shared savings approaches. Other manufacturers such as Osram, Phillips and General Electric have also jumped on the bandwagon.

And we have shared with them our long-term plans and they in turn have lent their skills and resources to broaden the skill base in the industry generally and to assist in training our own staff.

We use lighting product knowledge days to expand the network of allies and increase customer interest. We actually held a special series of product knowledge days across Northern Ontario to address the product supply issues that our field staff had identified and I spoke about earlier.

We host special lighting industry meetings to announce changes to the programs. We use a co-operative advertising program to leverage our advertising dollars and to encourage manufacturers, distributors, and contractors to focus their ads on efficient products.

We use the lighting concept centre, which is a private sector facility, to showcase new lighting technologies. We use it to train our field staff and municipal utility staff.

We are also designing training for general electrical contractors in concert with the Ontario Electrical League in order to expand the army of contractors equipped to do lighting retrofits.

We are also designing training modules for interior designers, which will be offered through Ryerson Polytechnical Institute, to help them understand energy efficient lighting options. This is particularly critical for retail stores where over 50 per cent of their electricity bill is for lighting.

We are also working on the product development front. Electronic ballasts show great promise for electricity savings but as yet there is no Canadian standard. And while we work with the manufacturers in the Canadian Standards Association to establish one, we provide incentives for electronic ballasts when they are matched to a T8 lighting system and the manufacturers are prepared to honour warranties for lamps used with the ballast.

Q. Now in your judgment, Ms. Fraser, is this general approach working?

A. Yes, it is. And recent market research has told us that 98 per cent of those surveyed who had participated in the program were satisfied with the program. The main finding of the study was that the implementation of the energy efficient lighting program has been very successful and no significant changes were required. And I believe that our lighting program is changing the lighting industry in Ontario.

It's going from the order-taking business it was to a value-added service business. The size of some of the lighting projects is really amazing. For example, we provide an incentive of $739,000 to Carleton University to offset the cost of converting 30,000 fluorescent fixtures to a state-of-the-art T8 lighting system. This is the largest T8 lighting system in Canada and, to our knowledge, the third largest in North America.

The demand savings that we saw were 860 kilowatts and this represents an avoided cost in the order of $1.8-million and a net total customer benefit of over a million dollars. Carleton University itself will save about $200,000 on its annual electricity bill.

In the industrial sector, we are working on a major project with a company in the mining

industry that will save over 3 megawatts.

Q. What about the various levels of government? Are you working with them on these things as well?

A. Yes, we are. In addition to encouraging them as customers to make their facilities as energy efficient as possible, we work with them to implement programs and develop the energy efficiency infrastructure, including setting standards and revising building codes.

We work with the provincial government in many areas including its strategic procurement task force to determine how manufacturering energy efficient products can be expanded in Ontario. We are working with the federal government on building standards.

And at the local level, we are working with cities like Burlington who now require that all new buildings participate in Hydro's commercial energy management programs before they get necessary development approvals.

I participated in the City of Toronto's special advisory committee on the environment which recommended an aggressive energy-saving plan to help Toronto meets its CO(2) reduction targets.

Q. Do you expect to be using similar

strategies and tactics through the 90s?

A. Yes, I do. But the proposed changes to the Power Corporation Act and the provincial government's interest in using more aggressive standards, we are now taking a look at all of our programs to see what changes have to be made. Many existing programs will have to change and fuel switching programs will have to be developed.

Using aggressive standards isn't as simple as it may seen. Standards have to be developed, communicated and enforced. We expect to play a role with the government in all of these activities.

But I also expect that as we get more experienced with what works and what doesn't, what projects provide the maximum savings, we will continue to increase incentive levels for those more valuable projects.

What won't change, however, is our fundamental approach to the marketplace and our pursuit of all the economic demand management we can get. We will continue to target programs on customers and technologies and end uses that maintain or improve the energy service while we reduce the use of electricity and the electricity bill. And building the infrastructure will continue to be a critical element

between now and the year 2000.

The guaranteed energy performance program is already expanding the number of companies interested in energy performance contracting. The Loblaws compact fluorescent program last fall created a retail distribution channel for these lamps where one hadn't existed before and where both the retailers and manufacturers were convinced it never would.

We expect to build on all of these successes to meet the challenges ahead.

Q. I want to focus a little bit more tightly on each of the market segments. And in this area, although you have been left till last, Ms. Mitchell, we are going to start with you.

MS. MITCHELL: I guess you save the best for last.

MR. B. CAMPBELL: There is a true marketer. (laughter)

Q. Now, Ms. Fraser has told us about the general kinds of program strategies that the company is pursuing. Could you describe the overall strategy when it is applied to the residential sector.

MS. MITCHELL: A. Yes. Like the commercial and industrial markets, the residential sector is very diverse in its customer needs and

therefore it requires a strong mix of approaches in order for us to achieve the results we are looking for.

Our program strategies address the critical market barriers that prevent customers from making energy efficient choices now and into the future. These barriers, which Ms. Fraser mentioned earlier and I will reiterate, include a lack of consumer awareness of the need and opportunity to increase energy efficiency as well as the premium cost of energy efficiency measures and effective channels for delivery of energy efficient products and services.

Q. Now in the residential area, what have you been able to observe with respect to customer awareness and what strategies has Hydro adopted to overcome those barriers?

A. Well, market research tells us that many residential consumers believe that they have taken actions to make their homes more energy efficient. However, studies such as the one undertaken by Hydro of a thousand electrically heated homes, which is item No. 4 in Exhibit 261, has shown that there is significant potential there that is yet untapped. This infers that lack of awareness I mentioned earlier of the need for energy efficiency.

So, to address this barrier, we utilize

mass marketing campaigns such as the recent coupon campaigns with Loblaws and Canadian Tire. The visibility of these initiatives has resulted in increased awareness of energy efficiency opportunities that meet customer needs not only for saving energy but saving money and reducing the negative impacts on the environment.

We also use residential energy audits which identify energy efficiency opportunities to customers and assist us in effectively targeting the delivery of our programs appropriate to those opportunities.

Within the residential marketplace, there are distinct groups such as homeowners, purchasers of new homes, and consumers of all types who turn on appliances and lights. By segmenting the market in this way and providing a broad menu of programs, we can be more effective in increasing the awareness of energy efficiency opportunities.

Raising consumer awareness lays the important foundation for future success; however, by itself it's not enough.

Q. Now can you describe how this range of programs you spoke of address the kinds of barriers you have outlined.

A. The programs include a mix of information combined with incentives and standards. Incentives, as Ms. Fraser mentioned, are incorporated into programs to offset financial barriers that prevent greater penetration of more energy efficient technologies that are obviously more expensive.

Working together with governments and standard setting bodies and industry is an important strategy element of the residential programs such as R2000 and heat pumps in an effort to raise the electrical efficiency of appliances as well as the energy efficiency in building codes.

Mr. Wilson and Mr. Burke have described the role of standards and we anticipate that the contribution of standards will accelerate our ability to deliver energy and demand savings in the future.

But critical to the success of demand management programs in the residential sector is the ability for us to get them to the end user.

...

[12:16 p.m.] There are existing channels of delivery that are underdeveloped and there are new channels that are yet to be explored and exploited.

Design of our current programs illustrates our commitment to building and supporting channel infrastructures which include municipal utilities, manufacturers, distributors, retailers and builders.

Not only do we leverage our activities through these channels, but we also need their valuable expertise and experience throughout the program development and delivery process.

Q. Now, as these programs or strategies are applied in the residential sector, are they also similar for the agricultural sector?

A. Yes, they are; however, the focus is different, in that the information and incentives are positioned more in a business context. That is to say, the increased cash flows and payback are very important considerations in sustaining farm operations.

As well, the farm sector is concerned with equipment reliability and service. These programs address the specialized needs by providing technical information on energy-efficient farm technologies and incentives to reduce the up-front capital cost of

energy efficient measures all in one convenient package.

Q. Now, what kinds of results do you expect to achieve in the residential and agricultural sector with these strategies?

A. As documented in Exhibit 76, the net load impact forecast, by the year 2000, we have forecast 580 megawatts of load reduction.

But as Mr. Burke has pointed out in his testimony, there are some very significant opportunities that can be achieved with tougher standards and with fuel switching.

This clearly means that we will need to reassess our existing portfolio of programs to effectively deal with whatever policies and standards are introduced and we are prepared to do that.

Q. And can you describe generally the kinds of programs Hydro has in place, the actual programs themselves, for residential and agricultural customers?

A. As I said earlier, we do have a broad menu of programs to help residential and agricultural programs save energy and money. They include energy audit programs for farms and residential customers, the merchandising and mass media campaigns which I

described earlier to increase consumer awareness, as well as incentive programs to offset those financial barriers, and direct installation programs such as the water heater tune-up program which is currently being expanded to an all-inclusive home tune-up program.

Q. All right. Now could you tell us about the audit programs, please, in this area?

A. The power savers audit program for residential customers was test marketed in cooperation with North York Hydro in 1990. The program is an information package with a detailed questionnaire that is mailed directly to customers in single-family dwellings.

The customer completes the questionnaire, specifying energy uses, consumption patterns and home characteristics and then returns it to Hydro for processing.

A customized report is prepared and returned to the customer showing where that energy is used, how efficiency can be improved in the home, as well as the estimated dollar savings for each of those measures.

The response rate in North York Hydro in the pilot test was 32 per cent. In the absence of advanced program advertising, this response rate is

considered high when compared to the average response rates for direct mail promotion in general.

Since that time, we have sent customers 91,000 questionnaires and provided completed reports to over 32,000 customers.

Hydro will expand this program beginning in January of 1992 and will mail the power savers audit questionnaire to all single-family homes across the province over the next three years with follow-up visits to approximately 600,000 customers.

In addition to the residential audits, we also provide audits to large farms that use more than 10,000 kilowatthours per month. There are about 1700 of these across the province. Hydro offers customized farm audits where a trained consultant makes an on-site assessment of the opportunities to save energy and to save money.

The customer is then provided with the recommendations and relevant program information which I referred to earlier. This insures that farm operators have the tools to make the business decisions that result in those dollar and energy savings.

The audit was made available this year and to date, we have provided this customized analysis to over 60 large farms. And we will offer this service

to all 1700 large farms across the province over the next four years.

Q. And you mentioned mass marketing campaigns. Can you describe these programs and what they are intended to achieve?

A. Well, we are really trying to do two things with these types of programs: Firstly, we want to increase the awareness in the consumer of opportunities to increase energy efficiency; and secondly, if we can show retailers and manufacturers and distributors and consumers, or show these people that consumers know about these products, then they will take the necessary steps to get these products to market.

Examples of these coupon-based retail programs include promotions with Home Hardware, Canadian Tire, manufacturers of energy-efficient shower heads, a recent promotion for cold water rinse, and the Loblaws' compact fluorescent program, of which I am sure you are well aware, which has now been expanded to include all CSA-approved compact fluorescent bulbs and retailers who stock those products.

And together, these programs have delivered 14 megawatts of load reduction to the end of May of '91 and represent the purchase of well over a

million energy-efficient products.

So our experience shows us that these promotions meet the two objectives that I spoke of earlier and we fully expect that these will be a regular part of our energy management efforts in the future.

This fall, you will be seeing another example of a discount coupon promotion with many retailers which we refer to as the fall wrap-up campaign.

Q. And what incentive programs are you offering to residential and agricultural customers?

A. Well, Hydro has a range of incentive programs that cover the major end uses in new and existing and the agricultural market sectors.

Premium costs of energy-efficient technologies is one of the barriers to adoption of these measures. So these incentive programs are, therefore, there to reduce and sometimes eliminate those premium costs.

In the new and existing housing segments, Hydro currently offers incentives for energy-efficient heat pumps, energy-efficient windows, as well as the construction of energy-efficient homes such as the R2000 home.

Unlike the rebates covered by the mass consumer promotions, these incentives are for big ticket items that are most often installed by contractors and builders and are not really considered do-it-yourself projects.

They require personal selling by trained specialists to effectively communicate the energy and cost-saving benefits of such an investment.

Q. Now, as an example, could you advise how the incentives were used in the heat pump program?

A. Well, one of the primary barriers to installing a heat pump is the initial capital cost. Even though heat pumps are up to 300 per cent efficient compared on -- or depending on the type of heat pump compared to electric resistance heating, and with saved customers, up to 65 per cent on their energy bills, on their heating bills, they are more costly to purchase and install than an electric furnace and a central air-conditioning system.

So, Hydro offers incentives to help the consumer with the incremental or premium cost of heat pumps and to encourage them to install this energy-efficient technology.

These incentives are available to owners of existing electrically-heated homes and purchasers of

new homes only in areas where natural gas is not available.

This design element insures that incentives for the installation of heat pumps contributes to load reduction and does not promote the increased use of electricity.

The heat pump incentive program has been especially effective in reducing peak demand and delivering energy cost savings to purchasers of new homes and owners of existing homes.

Since the program was launched in May of last year, 5200 heat pumps have been installed in non-gas available areas, which represents approximately 15 megawatts of load reduction.

Customers who purchased these heat pumps will collectively save $3.5-million in electricity costs they would have spent in comparison to less efficient electric resistance heating equipment.

If, however, there is a decision taken, and it certainly would appear that is the direction we are moving in, to pursue switching to oil or propane away from electricity or to the natural gas option, this is one program we would certainly have to reassess in that context.

Q. Now, you mentioned incentives for

R2000 homes.

Could you briefly describe that program?

A. Yes. In the new home market, incentives are available to new home buyers and builders of electrically-heated homes in non-gas areas to upgrade to R2000 construction.

The incentive was recently increased to cover up to 90 per cent of the incremental cost of R2000 from the current building code.

This market is important since it represents a cost-effective opportunity to incorporate energy efficiency at the design stage rather than at the retrofit stage.

Here, incentives are used to increase consumer awareness of this energy-efficient option, while, at the same time, encouraging builders to build and supply this product.

Q. Now, do any of the incentive programs in the residential sector eliminate the premium cost of an efficiency measure?

A. Yes. In June of this year, Hydro introduced incentives for the installation of energy-efficient windows in new and existing electrically-heated homes. The incentive covers virtually 100 per cent of the incremental cost.

Q. And what about incentives in the agricultural market sector, could you outline those, please?

A. In the agricultural market, incentives are available for energy-efficient lighting in farm buildings and livestock facilities.

In 1990, over 84,000 compact fluorescent lights were installed using the lighting rebate which reduced peak load by 1.5 megawatts.

As well, incentives for energy-efficient heat lamps used primarily in hog operations delivered an additional 1.5 megawatts from October to December of last year.

All of these incentive programs are combined with information and target specific market segments through appropriate delivery channels.

The leveraging element of the energy management strategy is no less important in the residential sector than it is in the commercial or the industrial.

Working through builders, contractors, industry associations, utilities and governments insures that the information and the tools to increase adoption of energy efficiency is readily available to the consumer.

Q. Now, you have indicated that Hydro intends to use direct installation programs as well and perhaps you could describe what they are all about.

A. Well, the United States experience has demonstrated that higher levels of penetration can be achieved with direct installation programs. And that is not surprising if you go into a home and physically install items you might otherwise leave with the customer or, at the very least, leave information and perhaps coupons for a future purchase.

However, there is a balance there. We can't visit every home every year, but we do have direct installation programs.

The water heater tune-up program was launched in May of last year and has met with considerable success. It is a free service that is delivered directly by Hydro and participating municipal utilities to customers who own or rent electric water heaters.

The measures installed in the tune-up include a tank insulation blanket, pipe wrap and an energy-efficient shower head and adjustments to the water heater thermostat.

The program to the end of June of this year has achieved 4.7 megawatts of load reduction with

over 65,000 tune-ups being completed. 43 of our own Hydro retail offices and 108 of municipal utilities are currently delivering this service directly to their customers.

Hydro is now working on expanding the scope of this program to an all-inclusive home tune-up program. It is a direct result of the new available funds since the nuclear moratorium. This comprehensive program will use the information collected through the power savers audit program with follow-up visits to at least 600,000 customers where water heating, lighting, and caulking and weather stripping measures will be directly installed.

Appropriate to that individual home, customers will also be provided with information on incentives available and the names of local contractors participating in those programs.

...

[12:30 p.m.] The home tune-up program will reduce peak demand by 56 megawatts. It has a net benefit to society of $135-million. This new initiative is a demonstration of a strategic shift to become more directly involved in the market for energy efficiency.

Q. Now you mentioned the home tune-up as one example of the impact of new funds that were diverted from nuclear pre-engineering. Are there any others in the residential sector that have enjoyed this benefit?

A. Yes, there are.

We are currently working with manufacturers and retailers to produce and stock lower wattage energy saving incandescent bulbs that give slightly less the amount of light output. In November we will be distributing approximately 6-million 52-watt incandescent bulbs and coupons for compact fluorescent and halogen lights to all Ontario households. This will automatically replace 10 per cent of the total incandescent market which is approximately 50-million bulbs. It is expected that the program will deliver 12 megawatts in 1991.

Q. Looking a little into the future, what kind of programs do you envisage developing and implementing in the residential and agricultural

sectors?

A. There are concepts that have been assessed and recommended to go to pilot implementation. And based on U.S. experience with programs such as Hood River, Hydro is testing the community-based conservation delivery approach in the Town of Espanola.

In addition, we are conducting test market programs for refrigerator buy backs, compact fluorescent bulb leasing, and heater sizing and heat exchangers for the farm market. The results of these pilots will provide valuable information for taking these programs on a province-wide basis.

Q. Now given your experience with demand management in the residential and agricultural marketplace to date, what do you see as being the ingredients for success in that market sector?

A. Hydro generates electricity. It does not manufacture, stock or sell the equipment that uses its product. Just as in the other sectors, we must therefore continue to build and strengthen the important links in the chain that lead to an energy efficient Ontario. This means doing more and working effectively with all of the allies in the chain in creating this environment for energy efficiency.

Government policy with respect to fuel

switching and regulatory support of more energy efficient standards is expected to increase the opportunities for demand management. We are very interested in pursuing whatever steps are necessary to support those programs, make them effective and acceptable to our customers. Demand management megawatts are the result of many individual contributions and we can help make that happen.

Q. I want to turn back to you then, Ms. Fraser. You have told us already that different marketplaces are different. Again, more at the program level, I want you to outline how you are approaching the commercial sector.

MS. FRASER: A. Our commercial strategy has three elements: target, leverage and energize. Now Mr. Campbell has told me many times not to get bogged down in marketing jargon, so I will explain what I mean by those.

Targeting. We are focussing our programs on key decision makers and we tailor our programs and communications to account for the fact that the needs and requirements of different customers are different. Office buildings are different from universities; universities are different from hospitals.

Even if the products technologies that

satisfy those needs are the same, we have to appreciate the business situation that each of our customer groups face. In particular, we have to identify the trendsetters who may be willing to try new products and we have to show them how energy efficiency makes good business sense; that it is in fact an investment opportunity with a high rate of return.

The second point was leverage. And I talked earlier about Hydro is generally pursuing a strategy of leverage to leverage our resources and get our allies playing a part in energy efficiency. In the commercial sector, this is particularly critical. With over 800,000 commercial accounts, many of whom are very small, we need to leverage our field staff to reach all of those customers.

Many commercial customers are, for instance, like chain stores. One owner has many properties in different parts of the province. For example, we are working with Canada Trust, who is not only colouring their consumer advertising green but is pursuing a green strategy for their buildings.

Their new office complex in Kitchener is participating in our savings by design program and will be a showcase of energy efficiency. But they are also trying out new products and technologies in one

location and we are working with them to do so. If they work and the savings are demonstrated, they will implement them in other locations. Focusing on the decision maker at the corporate level, rather than trying to hit every individual Canada Trust location, is one example of leverage.

And the third almost was energize. Energy efficiency is a business opportunity. It involves premium products and a value-added service. We are encouraging the allies as well as the customers to see it that way. For example, last year we expanded our feasibility plan, which pays the cost of consulting engineering projects to look at the feasibility of an energy efficiency project. Rather than paying only 50 per cent of that cost, we announced that we would pay the other 50 per cent as well if the project went ahead. Of course, this is in addition to the incentives that we pay on a per kilowatt basis.

What this did was make Hydro's feasibility plan a business development tool for consulting engineers. And this was particularly timing given the impact of the recession and the downturn in commercial construction.

After all, these same consulting engineers designed all the existing buildings in

Ontario and now with new technologies and new economics as a result of our incentives, they could return to the building that they designed and essentially harvest the energy efficiency they had to leave behind when it was first built.

Q. How does that approach in the commercial side compare with the industrial side?

A. Well, our industrial strategy is different from the commercial strategy, particularly for the very large industrial customers. While there are about 18,000 industrial customers in Ontario, some 200 or so large customers whose average monthly demand exceed 5 megawatts, these account for 66 per cent of industrial electricity use and 23 per cent of total provincial electricity use.

As Mr. Burke pointed out, the heterogeneity of the industrial sector makes it difficult for us to determine the potential. It also requires us to develop individual relationships with each of these 200 large customers and tailor programs and projects to their specific needs and business requirements.

We use audits to identify energy saving opportunities followed by consultant feasibility studies to take an indepth look at the opportunities

and to scope out projects. We then use our incentive programs to reduce paypack. But it is not a one shot effort. The relationship and trust is built up over time with successful projects. The uniqueness of industrial processes from industry to industry and even from plant to plant demands such a tailored approach.

For the smaller industrial customers, we do use broader based programs and pursue a similar leveraging strategy as in the commercial sector.

Q. And what results do you expect to achieve in the commercial and industrial sectors with these strategies?

A. Prior to developing the scenarios that Mr. Wilson described this morning, we expected the commercial sector to deliver 1,055 megawatts of electrical efficiency improvements and 120 megawatts of load shifting.

The industrial sector was expected to deliver 420 megawatts of electrical efficiency improvements but 765 megawatts of load shifting. We will of course be revising these targets as we develop fuel switching programs and see what the impact of more aggressive standards will be.

Q. Now, again I want to focus a little more tightly on the particular programs and could you

give us again, starting with an overview, an outline of the programs that Hydro has in place for commercial and industrial customers.

A. Even though the strategies are different, where we can we have developed programs that apply across both sectors for applications or technologies which are common and we have tailored programs for each sector where they are required.

For both commercial and industrial customers we have audit programs to identify opportunities and a combination of incentive and technical information programs to increase awareness and reduce technical barriers to the adoption of new efficient technologies.

Q. Can you give us a little more detail about how the audit side works in these sectors.

A. The commercial and industrial power saver audit, as we call it, is carried out by specially trained auditors who take an inventory of all the energy-using equipment in the customer's premises. The report provides an individual profile of energy use in the building or the plant and recommends the energy saving options. It provides cost and payback data as well as details about Hydro's incentive programs.

Since this program began two years ago,

Hydro has completed almost -- had completed 3500 audits and identified over 180 megawatts of potential to the end of June 1991. Since that time, and not shown on the chart here which is in page 77 of Exhibit 260, is an additional 500 audits that have been done since the end of June.

And we also provide more indepth consultant audits to customers whose industrial processes require specialized analysis. These are shown in page 78 of attachment 260. Since this program began in May of last year, 135 consultant audits have been done and 120 megawatts of load reductions have been identified.

When we began the audit programs, we knew that audits alone would not achieve the kind of results we wanted. And research has since told us that within a year of receiving the audit report, customers implement only about 35 per cent of the recommended measures and generally they are the no cost, low cost kinds of things.

So we follow up on the audits to use our menu of incentive programs to encourage and finance the more expensive energy saving measures.

Q. What incentive programs do you offer in the commercial and industrial sectors?

A. Hydro has six programs that apply to both sectors. The lighting program, which I talked a bit about earlier, provides both product specific incentives and customized incentives for redesigns. It has been the single most successful program to date and we expect it will in the long term, lighting technologies can improve efficiency by 25 to 75 per cent.

By the end of 1991 we will have commitments for 120 megawatts of savings. This is 12 per cent of the potential that we have identified over the decade. This is shown here on page 79 of Exhibit 260. This represents over $100-million in lighting projects for which Hydro will pay more than $30-million in incentives. The avoided cost from these projects will be in the order of $200-million.

Next the high efficiency motor program provides incentives of $12 per horespower to customers and $3 per horsepower to distributors or original equipment manufacturers, who put motors in the equipment that they then turn around and sell. The pilot program ran from June 1987 to September 1988 and the results are shown on page 80 of Exhibit 260. During the pilot, 236 motors were affected with a savings of 191 kilowatts.

When the provincial program was launched in late 1989, it was changed as a result of what we learned in the pilot; and, in particular, the incentive that I mentioned earlier to distributors was added. Since then almost 3500 applications have been processed resulting in a total savings of almost 9 megawatts.

And although over 70 per cent of industrial electricity and almost 50 per cent of commercial electricity is consumed by motors, as Mr. Burke pointed out yesterday, the potential from motors is not as large as from lighting because the unit improvement and efficiency is much less, about 2 to 6 per cent. More savings will come from the equipment that motors drive: fans, pumps, blowers.

To capture these savings and to make use of adjustable speed drives, we have recently introduced the performance optimization program which will cover motor-driven equipment. The five-year target for this program is 85 megawatts.

I have already talked quite a bit about the feasibility assistance plan which pays for consulting engineering studzies for energy saving projects. This program began in 1987 and by the end of 1991 we expect that 500 projects will have been approved, resulting in $9-million in Hydro funding.

These results are shown on page 81 of Exhibit 261.

And then on page 82 the results of the business finance plan are shown. This plan is offered through chartered banks. Customers can apply their incentive to their interest payments and end up with a zero interest loan. Often, the repayment of principal is less than the monthly electricity bill savings, which can mean that even before the upfront capital is repaid the customer can come out ahead financially.

...

[12:47 p.m.] Since it began in 1987, 153 loans totalling $14-million have received preferencial interest rates. This program was particularly useful during our street lighting pilot program.

The final program that is offered to both sectors is the guaranteed energy performance program which I mentioned earlier. It was launched only this year, but already we have 50 projects under consideration representing 20 megawatts of potential.

And we are seeing an expansion of the energy service industry in Ontario, including the entry of U.S. energy service companies or ESCOs into the Ontario market.

Q. Now, you also mentioned that there were tailored programs for each sector and perhaps you could review those for the industrial sector.

A. In the industrial sector, we have one tailored program to save energy, called accelerated payback, and one to shift energy use off peak, the load shifting program. Both provide incentives to reduce the payback on projects to as little as 18 months.

One of the major barriers to the acceptance of energy efficiency in the industrial sector is payback. And in the current financial climate, the acceptable payback is shorter than ever.

The results of the accelerated program are shown on page 83 of Exhibit 260. And since it was launched in the fall of 1989, we project that by the end of 1991, we will have 231 projects that we will have considered, representing 40 megawatts of savings.

The load shifting program which was only launched last year has shifted 12 megawatts off of peak as of June 30th, 1991.

Both of these programs are designed to allow our field staff to tailor them to meet the varying needs of the different industrial customers. We can entertain energy improvements from any technology, any product, any process under this program.

And when we uncover projects which can be transferred to other customers, particularly those 17,000 plus smaller industrial customers, we have put specific campaigns together to do just that.

So far, we have done this for compressed air, refrigeration, motor generator sets and turbo expanders. And we will continue to expand this list as we go on and identify new opportunities.

Q. All right. And what about the commercial sector side?

A. In the commercial sector,

decision-making processes are more complex and some of the barriers are perverse.

As a result, we have one comprehensive program for both saving and shifting energy and then we have a number of targeted or niche programs that address specific barriers.

Our comprehensive commercial program is called savings by design. It is primarily targeted to consulting engineers, architects and developers for the new construction market, as well as to building owners and managers for existing buildings. It provides incentives to any project that reduces electrical demand or energy.

In such cases, we use a customized approach and calculate incentives at a rate of $500 per kilowatt saved or $400 per kilowatt shifted.

For projects that save energy without peak demand reductions, we apply 10 cents per kilowatthour for the first year energy savings, which is consistent with the accelerated payback program in industrial.

For savings by design, electricity savings are determined using a computerized building energy simulation which also assists consulting engineers in modelling a number of efficiency options.

Under savings by design, we also have product-specific or prescriptive incentives for a number of products such as ground source heat pumps and window film, and we are working to expand this list.

We launched savings by design in 1989 and the pace of applications is growing rapidly, as you can see from Exhibit 85 on page 260.

We had 340 projects on the books at the end of 1990. And by the end of 1991, we expect to have over a thousand projects representing 140 megawatts of demand reduction.

Q. I think that is page 84.

A. 84, I am sorry.

Q. 84, right.

Now, what are the targeted programs that you mentioned for the commercial sector?

A. Well, we currently have five targeted programs: The occupancy sensor program for hotels and motels, the nonprofit housing program, the government building program, the T8 lighting program for new construction, and the street smart lighting which builds on the success of our pilot program to encourage municipalities to convert their street lighting systems to high efficiency lighting.

In the fall, we will launch the

multi-residential individual metering program which will be implemented by participating municipal utilities.

Q. Now, what impact did the transfer of nuclear pre-engineering funds have on programs in the commercial and industrial area?

A. With the additional funds, we have been able to accelerate programs that were on the books and capitalize on some new opportunities.

In the commercial sector, the nonprofit housing program, higher incentives for T8 lighting and new construction and the government building program are in this category.

We intend to announce an enhancement to the savings by design program early next year. It will base incentives on the new construction building standard issued by the association of heating, refrigeration and air-conditioning engineers, ASHRAE 90.1 that I mentioned earlier.

We are also working on a chain account program which will formalize the approach that we have used with multi-location customers like Canada Trust.

Q. Now, why are you using higher incentives, as you mentioned, for T8 lighting and new construction?

A. Basically, to avoid lost opportunities. It is cheaper to install energy-efficient lighting when a building is being built than doing a retrofit after the fact.

We had first included T8 lighting in our lighting program about a year ago. As an energy-efficient technology, it is very valuable to Hydro.

As Mr. Burke pointed out, these 32 watt T8 lamps in conjunction with electronic ballast deliver more light with better colour rendition and use 35 per cent less energy than their 34 watt T12 counterpart.

Because of its value and its higher costs, we set higher incentives including the whole fixture costs. We were using a 50 per cent cap on projects, but this was proving to be a barrier for new construction. So, with the additional funds, we were able to move faster on this opportunity than we expected.

We will be setting the incentives for the new construction enhancement to the savings by design program with this same philosophy.

Q. And can you explain what the nonprofit housing program is all about and why you focused on that market?

A. Well, a year ago, we completed market research which told us that the biggest hurdle for energy efficiency in nonprofit housing was the way the Ministry of Housing's regulations drive design and construction decisions.

Briefly, the Ministry uses a maximum unit price to guide its funding decisions. This ensured that the lowest first cost for construction including the energy systems was achieved.

As a result, nonprofit housing developers almost always used electric baseboard for the heating system because it was cheaper than installing a gas heating system.

However, the operating costs, of course, are almost twice as much. These costs, however, are passed on to the tenants.

Last August, the Chairman of Ontario Hydro raised his concern with this practice with the Deputy Minister of Housing.

As a result, the Minister of Housing announced a ban on the use of electricity for space and water heating in areas where gas is available with the exception of heat pumps.

While this ends inappropriate choice of fuel, it does nothing to remove the fundamental barrier

to energy efficiency in this marketplace.

To address the existing buildings in this market, we have developed the nonprofit housing retrofit program, a direct installation program which will cover 100 per cent of the cost of retrofits for lighting, air leakage control and water heater tune-ups for nonprofit housing units.

Q. All right. You also mentioned a government buildings program.

Could you tell the Board about that, please?

A. Again, this was a matter of opportunities coming together. After we launched our power saver audit program in mid-1989, we began negotiations with the Ontario Ministry of Energy to do audits on provincial government buildings.

This required the cooperation of the Ministry of Government Services which manages the provincial buildings. For reasons which were never clear to me, the Ministry of Government Services weren't too keen on this and negotiations drifted.

Needless to say, we were surprised to learn of a call for tenders for building audits issued by the Ministry of Government Services, so we submitted a tender at the same price we charge all of our

customers, zero.

Meanwhile, we were having discussions with staff in the federal department of Energy, Mines and Resources about auditing federal buildings. And last September, it was announced that federal government would work with Hydro to audit federal buildings in Ontario.

Shortly after, we reached an agreement with the provincial government to audit all of its buildings over the next five years.

The additional resources from the nuclear pre-engineering funds allowed us to triple our audit program. Instead of doing between 1000 and 1500 audits per year for all buildings in Ontario, we are now going to do that many in addition to the 1300 per year for each of the federal and the provincial governments.

But as I said before, audits by themselves do not save energy. We are negotiating follow-up programs with both levels of governments to ensure that the savings are achieved and that purchasing policies and other institutional barriers to energy efficiency are removed. But needless to say, one of the major barriers for both governments is financing.

Q. All right. Now, Mr. Wilson, just to

finish this section off, we have heard about demand management potential, strategies, programs, new latitude to pursue fuel switching and increased government support for more aggressive energy efficiency standards.

Now, with all of this, are you satisfied that the increased expectations for demand management are reasonable for planning purposes?

MR. WILSON: A. Yes. I am satisfied that the levels of load reduction that we have identified in Cases A, B, and C are feasible and ambitious. But as I have explained, I can't say the same as about Cases D and E.

The goal of 5200 megawatts for the year 2000 is a challenge that will call for best efforts and not just for Hydro alone. The challenge is to the people of Ontario to get involved personally and within their communities, to government to show leadership in setting efficiency regulations through products, building codes and policy for appropriate fuel use; a challenge to manufacturers, architects, engineers and all the people we have been talking about to upgrade their knowledge and skills to support an energy-efficient Ontario; and certainly not the least, the suppliers of other fuels - gas, oil and the solar

industry - to extend their supply capabilities and their active with the province's energy policy.

To achieve demand management goal, the one we have been talking about, the challenge has to be tackled by everyone with spirit of enthusiasm and cooperation. That is how we will be approaching it; working in collaboration with everyone who can help us succeed.

MR. B. CAMPBELL: And on that note, Mr. Chairman, we will be turning next to four particular areas that we want to address, but it would be a good time for the lunch break.

THE CHAIRMAN: All right. We will adjourn until 2:30.

---Luncheon recess at 1:00 p.m.

...

---On resuming at 2:35 a.m.

THE CHAIRMAN: Be seated, please.

MR. B. CAMPBELL: Thank you, Mr. Chairman.

Now, Mr. Chairman in finishing this panel's direct we will be dealing with four items: This business of comparisons amongst potential and the effect of increased avoided costs first; second would be discussion of certain rates matters with Mr. Harper; third will be discussion of program design incentive examples with Ms. Fraser, and finally, discussing some of the - and one particular area - ramifications of the alternative cases that have been laid out by Mr. Wilson, and of course those questions will be directed to them. I expect we will finish this afternoon. I can't promise by break.

Q. So, with that, Mr. Burke, if I could turn to you. In your evidence earlier you talked about potential induced EEI, electricity efficiency improvements. Could you briefly remind the Board what Hydro means by this concept, just as a starting point.

MR. BURKE: A. It's going back to what I said earlier. Potential induced EEI is the load reduction that would occur if there was 100 per cent take up of the economic efficiency improvement

opportunities that wouldn't occur naturally.

Now, Hydro's concept only looks at a portion of that full spectrum of electrical efficiency improvement opportunities. We clearly screen out of the opportunities that don't pass the total customer cost test, and we also don't include measures that would occur by themselves, that is naturally and/or implicit in the basic load forecast. And we have done this because the way the concept is now defined we can then multiply the potential by a penetration rate and the estimate that we get as a result can be subtracted directly from the basic load forecast and yield a contribution to the primary load forecast

Q. Now, is this the way the all other studies estimate the potential for electricity efficiency improvement?

A. I think it is fair to say that there are quite a few ways for estimating potential electrical effiency improvement. I have tried to structure the discussion by the categories I have introduced in this overhead, page 85 of Exhibit 260, and in it I have given the major alternative elements that are usually contained in an analysis of potential EEI. I have highlighted three major factors: The maximum efficiency level, and how that is determined,

what the reference efficiency level is, and also what I have called timing here but what I really mean is the pace at which the savings may be potentially obtained.

I have listed two alternatives for each of these parameters, you might say, of the potential estimating exercise. They are not a complete categorization of all possibilities, but I think they give a very useful description of the major alternatives that are used when estimating potential EEI.

I would say almost all permutations of the elements in this little matrix have been used in estimates of potential EEI in practice, and these yield quite a wide range of results that can be quite confusing, and I think you have to interpret the results very carefully.

So, I want to take some time to explain the difference because I think ultimately the Board will have to try to assess whether Hydro's estimates of potential are reasonable in comparison with other estimates that have been prepared for Ontario and estimates that are prepared in other jurisdictions.

Let me start then with the maximum efficiency level. That's simply determined by screening against avoided cost as we have described

and, in our view, if you are going to apply the total customer cost test you should have some reliable data to do so. We are talking about the sort of data we have mentioned before.

THE CHAIRMAN: Can you express for me what the maximum efficiency level means? What does that mean?

MR. BURKE: What I mean is that the maximum efficiency level -- sorry, what I should have said is the maximum economic efficiency level.

THE CHAIRMAN: Should that be changed then? Should we call that maximum economic efficiency level?

There are two, there is a maximum economic efficiency level and maximum technical?

MR. BURKE: Yes. That's what I want to draw a distinction --

THE CHAIRMAN: That's the way you want us to read this matrix?

MR. BURKE: Yes. So, I want to talk about the first, the maximum economic efficiently level, and I am glad you corrected me because I didn't make that clear.

This is the one we get using the total customer cost test and using information from

commercially-tested products, and that's the approach Hydro uses.

And the alternative is essentially the maximum technical efficiency level, and this is derived usually by relaxing one or more of the constraints that I have placed on the definition of economic. One might be to say that we can use reliable economic and -- sorry, cost and performance data, but we won't screen against avoided costs. So that would give you a higher level of efficiency technically than Hydro would include, or one could be even more liberal and say we won't worry about cost at all, we will take laboratory savings levels and that will be our estimate of technical efficiency level. And clearly, when you do that, either way, you end up with efficiency levels that exceed the economic efficiency levels.

THE CHAIRMAN: In other words, what you are doing is qualifying in some way the total customer cost test, is that right?

MR. BURKE: Well, the total customer cost test has implicit in it an avoided cost for supply options that Ontario Hydro feels reflects its avoided costs. And I suppose you could look at technical potential that is developed using information that's equivalently reliable as an application of the total

customer cost test with no restriction on avoided cost.

THE CHAIRMAN: I might have misunderstood you. I thought when you were telling me what maximum technical efficiency level was, it was starting with the result of the maximum economic level and making some adjustments to it. Did I mishear you on that?

MR. BURKE: Not really, no.

I think in both cases you are starting with a spectrum of efficiency improvement opportunities, and in the case of the maximum economic you apply a screen, essentially you say that anything whose total -- that does not pass the total customer cost test is not included in maximum economic potential.

In the case of technical potential, that screen doesn't real apply. Essentially, avoided costs do not restrict the technologies that are included in the estimate of potential. There is no bound.

You could say, we will consider measures at 10 cents, 20 cents a kilowatthour lifecycle cost, and we might or might not know what these measures really cost. We just know that they save a lot of electricity.

THE CHAIRMAN: Perhaps could you help me, what use do you make in your programs of the maximum

technical efficiently level?

MR. BURKE: We don't use that concept, and I am trying to --

THE CHAIRMAN: So, you are saying this is something that you shouldn't be using.

MR. BURKE: I am trying to explain that some studies do use it, and if you are comparing a study that has used this concept with one of ours, then you will likely get a different answer and you should appreciate why there is a difference. That's really why I am introducing this.

THE CHAIRMAN: All right.

MR. BURKE: So, if I can move on to the second column, the reference efficiency level. Essentially, when you are estimating potential, there almost must always be a base efficiency level against which efficiency improvements are measured, and clearly the higher that base is, the less the perceived efficiency gain.

Hydro's approach is reflected in the top box, the naturally occurring EEI, which is essentially a sliding base, it increases over time either through naturally occurring efficiency improvements or because the government regulates standards. And so this reduces the savings that you would observe over time,

other things equal.

The alternative that sometimes comes up in studies is a frozen efficiency reference case or reference level, and that essentially assumes that there is no natural efficiency gain in future.

Quite often the frozen efficiency level is applied at the same time as the concept under the third column, called instanteous replacement of existing stock, is used. So, that a study would suggest that the potential is -- a certain efficiency gain relative to what the efficiency of the existing stock is. And essentially the measure for the base level then is the average historical efficiency level in that particular end use.

When you do that, you clearly overstate the amount of efficiency savings that you are likely to achieve.

...

[2:45 p.m.] The existing stock on average is likely to be considerably less efficient even in the stock that you would buy today, so that the base level of efficiency has to be specified, clarified whether in fact it's the average embedded in the existing stock out there, all of the refrigerators, or whether it is simply the efficiency of the most recently purchased refrigerator.

If you take a look at the option for replacement of existing and new stock at a feasible rate, which I have labelled a dynamic option in the top box on the right, and you ask, well, how does frozen efficiency apply in that context, you can avoid a lot of the problems that arise when you apply a frozen efficiency to instantaneous replacement of existing stock.

Essentially you can correct for the difference between the historical average efficiency level and the efficiency level in new stock today by essentially saying all existing stock will be replaced by stock at the current level of efficiency and any new stock that we add will also be at that current level of efficiency. That's typically what is called a frozen efficiency scenario and it yields sort of a dynamic replacement of stock but not necessarily -- but

allowing it to be replaced by equipment that is at least as efficient as the equipment today.

The choice of timing option is quite closely linked with how you choose your reference efficiency level. And from my discussion, I hope it's clear that you can link frozen efficiency with either a dynamic replacement approach or an instantaneous replacement approach. But one thing you can't usually do is relate naturally occurring efficiency improvement to an instantaneous replacement approach because, almost by definition, you preclude the consideration of how equipment becomes more efficient over time when you say I am going to replace it instantly.

MR. B. CAMPBELL: Q. All right. Now obviously there are a variety of permutations and combinations here. I wondered if you you make these concepts perhaps a little more concrete by giving us an example.

MR. BURKE: A. I think the discussion is a little bit abstract perhaps and I hope I won't oversimplify with this example, but I am going to call on our ever popular refrigerator to try to make this a clearer issue.

In this example, the potential for electrical efficiency improvement is represented by the

potential reduction in the annual electricity consumption of the average new refrigerator by the year 2000.

Page 86 of Exhibit 260 contains some data about the various efficiency levels and replacement rates and then gives some alternative estimates of EEI that could result from different permutations of these. So, first let me start off by reviewing the consumption levels, the data at the top of the page.

Actually, I am going to start with the frozen efficiency level of about 1200 kilowatthours; that's the highest of the reference efficiency levels that would represent what a refrigerator would consume typically in 1990 and what we have assumed in the basic load forecast.

I would say that -- perhaps I should step back and say that these numbers are quite round but they are probably fairly realistic. The natural occurring efficiency by the year 2000 essentially means for us what we would expect a new refrigerator purchased in the year 200 to consume: roughly 800 kilowatthours per year.

In the left-hand column under Maximum Efficiency Level, the maximum economic efficiency level from Hydro's perspective, that is, the one I showed you

yesterday it's about 500 kilowatthours per year consumption level by the year 2000. And I think it would be reasonable to say that a technical efficiency level, maximum technical efficiency level for an average sized refrigerator in Ontario in the year 2000 could consume as little as 200 kilowatthours per year by the year 2000. There are models that consume close to that now, but as I said yesterday they are not economic.

The examples I have given for proportion replaced by 2000 in the right-hand column at the top of the page are dynamic replacements and instantaneous replacement. The dynamic replacement reflects the fact that refrigerators have a 20-year life and so by the year 2000 roughly half of them will be eligible for replacement and so that the average refrigerator in the year 2000 will only experience half of the efficiency gain that could potentially be obtained if all of them had been replaced by the year 2000. An instantaneous replacement essentially means that all of the refrigerators are replaced in 1990 and so effectively it's certainly replaced by the year 2000.

So, these parameters, I have calculated some simple estimates of EEI for the case of the refrigerator and I am only really going to look at the

extremes of this and take you through them, and the others I think you can figure out and puzzle over for yourselves.

But the largest case of a potential efficiency improvement is clearly when you take a frozen efficiency as your base case, your reference efficiency level, and compare it to a technical maximum efficiency level and then assume that the potential is achieved instantaneously.

So effectively applying all of the assumptions in the second row of the data section of the overhead. 1200 kilowatthours minus 200 kilowatthours gives you an efficiency gain of a thousand kilowatt hours per year, and that's applied to 100 per cent of the stock on average.

In the bottom example, we are doing something that looks a little bit more like what Hydro does. We take natural efficiency levels in the year 2000 and subtract the economic efficiency level to get an efficiency gain of 300 kilowatt hours per year and because not all refrigerators will benefit from this by the year 2000, on average half of them will, the efficiency gained, the potential EEI for the average refrigerator is a half of 300 or 150 kilowatthours per year.

Clearly there is quite a wide range of results that you can get. The largest case of 1000 kilowatt hours corresponds to an 83 per cent saving in refrigerator efficiency use, electrical use relatively to the frozen efficiency base. And the lowest case, Hydro's case, corresponds to about a 13 per cent efficiency gain relative to that base.

And these are all legitimate calculations. They are just different. And the question then is: Which one is the most useful for planning purposes? And I would submit that the approach Hydro has taken --

THE CHAIRMAN: I didn't get the last percentage.

MR. BURKE: 13 per cent. That's 150 over 1200.

THE CHAIRMAN: Why over 1200 and not over 800?

MR. BURKE: Well, I guess you can choose your base. I could have chosen 800 and gotten a higher number.

THE CHAIRMAN: On the basis of this analysis we are doing now, why not over 800?

MR. BURKE: It could be over 800, certainly. But I did want to, in the final process,

bring the comparisons to a common base. Yes, Hydro would probably express the efficiency gain that way.

THE CHAIRMAN: Which way?

MR. BURKE: The way you suggested relative to the 800.

MR. B. CAMPBELL: Q. No, but, Mr. Burke, the Chairman's question was why wouldn't Hydro express it relative to the 1200?

THE CHAIRMAN: No, no.

MR. BURKE: No, that's what I had done.

MR. B. CAMPBELL: So I am behind here?

THE CHAIRMAN: You are behind.

MR. B. CAMPBELL: That's fine, that's fine. Better me than you.

...

[2:55 p.m.] MR. BURKE: All right. So, while the approach Hydro takes may yield smaller percentage savings results, I believe it is the only approach that is consistent with Hydro's objective, which is to achieve the maximum economic load reduction through electrical efficiency improvement.

And looking at the pieces of that, again stepping back into a more conceptual discussion, utilities do require a dynamic approach. They require knowing the potential available at any point in time. Instantaneous potential isn't really a useful concept for planning purposes. And so across the utility world - and instantaneous analysis is really largely irrelevant.

And I think amongst most of the studies today, instantaneous replacement is excluded, but sometimes for effect, you do see studies that describe what would happen if everything was replaced overnight with the most efficient equipment available.

The interest in the maximum economic level of efficiency as opposed to the technical I think arises out of - for utilities anyway - out of least cost planning or integrated resource planning. There, the interest is in the maximum economic as opposed to technical and the planning is designed to achieve only

the optimal balance between demand and supply that is economic.

So, I think the major parameter in this discussion that remains somewhat undetermined at this stage is whether it is better to start from a reference efficiency level that is naturally growing or one that is frozen in efficiency terms.

Certainly, you are going to get potential EEI estimates that are larger in absolute and per cent terms when you use a frozen efficiency base.

I think the issue is whether from the perspective of correctly, ultimately developing a primary load forecast whether it is methodologically better to start from a frozen efficiency base and subtract total potential EEI or whether you should start from a basic load forecast which includes the natural component and just subtract the induced EEI.

MR. B. CAMPBELL: Q. Now, what do you see that choice as depending on?

MR. BURKE: A. Well, from Hydro's perspective, the choice depends on the practicalities of properly --

THE CHAIRMAN: I am sorry, can you give me that choice again?

MR. BURKE: The choice is whether you

should start from a frozen efficiency base and moving back to the broad question of calculating a total potential EEI for use in planning purposes, whether it is better to start from a frozen efficiency base and subtract the total potential for EEI - that is, the natural plus the induced EEI - or whether you should start from a basic load forecast, as Hydro does, which has essentially, as a reference level, the natural EEI already included in it and then just subtract only the induced EEI.

THE CHAIRMAN: Which is the way you have done it.

MR. BURKE: The latter is the way I have done it and I would like to discuss the pros and cons of this choice.

THE CHAIRMAN: All right.

MR. B. CAMPBELL: Q. All right. Now, you clearly have made a judgment in making that choice and what does that judgment depend on?

MR. BURKE: A. Well, the choice comes down to in practice whether you can better estimate frozen efficiency forecasts or whether it is easier as an alternative, because this is something that we are required to do with our approach, separate out the natural from the total EEI potential.

You have to do one or the other. You either have to produce a frozen efficiency forecast or you have to be able to make this separation. And I would say the issue becomes more complex because the way frozen efficiency projections are done can vary depending on whether or not they are included in a forecasting study or whether they are included in a study that would call itself a backcasting study.

Q. All right. Now, I want you to remind us about the distinction because I know it is one that you are going to be dealing with here. I want you to remind us about the distinction between a forecasting study, the kind of study you do, and what you have referred to as a backcasting study and why that is relevant here.

A. Sure, okay. Well, the issue of backcasting came up briefly in Panel 1. Essentially, my understanding of it is it entails picking a target or choosing a future for planning purposes and then working backwards to find a way to achieve it.

How difficult it would be to actually meet a particular load level target in a particular year depends probably on how the load growth would have evolved without policy intervention. And that is what we try to capture in the basic load forecast.

So, the distinction between forecasting and backcasting is, from our perspective, what would have happened anyway versus choosing what you would like to see happen and then trying to work back to a way of achieving it.

Q. All right. Now, in this backcasting context, does frozen efficiency tend to be applied somewhat differently than in a forecasting sense?

A. It is my understanding that it is. Utilities - and I think Hydro's attempts of preparing frozen efficiency forecasts are similar to some prepared elsewhere - tend to start from a basic load forecast or the equivalent to a basic load forecast and then try to then freeze the efficiency change parameters in an end-use model solution for that forecast.

But backcasting attempts to avoid some of the problems of forecasting, so it starts from the existing energy-consuming capital stock and projections of new stock additions, and these become a baseline scenario for EEI analysis simply by extending the current efficiency levels into the future. This is sometimes called a marginal frozen efficiency scenario.

Q. All right. And I want to look at the issues that you have raised in this in turn.

First, from the perspective of ultimately obtaining the best estimate of primary load, does it matter whether you start from frozen efficiency and subtract total EEI, or whether you start from a basic load forecast and subtract only induced EEI given that the natural is already reflected in the basic load forecast?

A. The theoretical answer is no. If you had perfect information and you had perfect end-use models, you should get the same result with either approach.

The problem arises in practice because of the difficulty in estimating a legitimate frozen efficiency forecast; that is, in my view, one that remains a legitimate forecast but freezes only efficiency changes, so that when you then subsequently subtract out the potential for efficiency improvement, you are getting a relevant baseline for planning purposes.

In Exhibit 25, Hydro reported, largely for information purposes, estimates of natural conservation that we had derived as the difference between the 1988 basic load forecast and the frozen efficiency forecast that we prepared.

And the way we prepared that frozen

efficiency forecast was to hold constant wherever possible the parameters which change efficiency over time in the end-use models.

As much as possible, the efficiency was frozen at 1988 levels and all other parameters were left as they were in the model run which produced the 1988 basic load forecast.

What this allows is that the evolution of market shares and electricity intensity that responds a lot to price and to income and various other effects. All of those are allowed to evolve as appropriate for a basic long-term load forecast.

Now, sometimes because there were limitations in the end-use models or the data we had about efficiency gains historically, it was not possible to isolate the pure efficiency effects and instead, we were obliged to freeze electricity use per unit of activity which is the same as freezing electricity intensity as opposed to freezing electricity efficiency.

If you freeze electricity intensity instead of electricity efficiency, you introduce an error into the underlying base case forecast.

The trends in electricity utilization over time, the increase in the quality of services for

electricity that customers require are -- these have had quite a strong trend historically.

To revert to our favourite refrigerator example, refrigerators are probably 30 per cent more efficient than they were 10 years ago, but on a per unit basis, the average refrigerator consumes roughly as much electricity as it did 10 years ago. And the reason is that the size of the refrigerator and the features on the refrigerator, which are effectively utilization effects, have offset the efficiency gain.

...

[3:07 a.m.] If you freeze utilization at the same time as you freeze efficiency, you essentially would result in a reference projection that is artificially low, and that's why it would not be a suitable reference forecast from which to subtract EEI estimates to obtain a primary load forecast, or a primary scenario for planning purposes.

There are other things that get left on the table in a frozen efficiency run using Hydro's model. Our models are sensitive to market share. As I mentioned, if you freeze the efficiency of only one fuel, such as electricity, and allow the other fuels to have the sort of normal trends in efficiency gain that they otherwise would have had, the market shares are distorted in that sort of forecast.

If you don't allow electricity to have efficiency gains over time, you really shouldn't be getting the increase in appliance use that our base case forecast would have in it, and you probably wouldn't even be producing some of the outputs that our industries are producing if we didn't have efficiency gains in our industrial use of electricity.

So, that the frozen efficiency forecast really becomes an artificial scenario, and in my view, is not a realistic basis for planning. Even the way we

do it, I don't consider a frozen efficiency case to be a suitable basis for planning.

Q. Now, recognizing the problems with frozen efficiency forecasts, I understand from what you said earlier that Hydro is instead obliged by its approach to separate out the natural EEI or the induced EEI, one or the either, from the total potential EEI because it's only the induced potential portion of the total potential that you subtract from the basic load forecast to get the primary. Am I correct in that understanding?

A. That's correct.

Q. And in your view, can this be done without introducing large errors into the primary load forecast?

A. I think so.

The possible errors that you could have are that you would either double count or understate the net load impact of EEI measures because of the difficulty you had in classifying, it was either a natural measure or one that needed to be induced through programs.

This is not likely to distort the primary load forecast nearly as much as the approximations that you get into when you try to produce a frozen

efficiency forecast.

In general, the changes in the EEI numbers have a much much smaller impact on primary load than changes in the base case load simply because of the relative scales of these two numbers. The EEI effect is a small proportion of the total load.

Also, most induced EEI measures may be readily classified and distinguished from natural measures because they clearly face market barriers to takeup such as high cost and so maybe assumed not to occur naturally.

So, after doing some work on a frozen efficiency approach to the basic load forecast, Hydro has rejected that methodology in favour of leaving the natural improvements in the basic load forecast and dealing with the problem of sorting out what is the induced EEI from the total.

THE CHAIRMAN: I just want to get something clear in my mind. First of all, why is it necessary for planning purposes to differentiate between natural EEI and induced EEI?

MR. BURKE: The way we have derived the primary load forecast from the basic load forecast involves subtracting out a certain number of megawatts. We have been discussing the previous number of 2000

megawatts and now 3500 megawatts as a combination of EEI and fuel switching, and it is important that that number be a number that does not double count savings or load that is already included in the basic load forecast.

THE CHAIRMAN: Perhaps I should have asked my second question first. Why is it necessary to differentiate between the base load and the primary load for planning purposes? Why does their have to be that differentiation?

MR. BURKE: Okay, that is a fundamental question.

The basic load forecast is, as we discussed Panel 1, is essentially a projection of what load would have been without intervention by Hydro to influence the amount of demand for electricity in Ontario.

It would not be possible to forecast the primary load directly. There has not been a long trend of Hydro's efficiency improvement programs or load shifting or load displacement, non-utility generation, which one could simply extrapolate into the future and never have to ask the question, what would load have been without Hydro's intervention in the marketplace.

Essentially, if Hydro had always been

intervening in the marketplace you might say, well, let's just project the bottom line, go straight to the primary load forecast. But because we have started up these programs relatively recently and they are ramping up very quickly, it's not possible to simply extrapolate from history into the future to determine a primary load. So, we have to have essentially some sort of base line to subtract the impact of these programs from.

THE CHAIRMAN: But they are both, in a sense, forecasting exercises. The EEI is a forecasting exercise.

MR. BURKE: Yes.

THE CHAIRMAN: With all the aspects that go into that.

MR. BURKE: Yes.

THE CHAIRMAN: Granted, different things have to be considered. But that is also true of the basic load forecast.

I just wondered why it is necessary to get into the additional complication of making this distinction between natural and induced other than just to be able to assess the success or failure of the demand management program.

MR. BURKE: That's sort of an

after-the-fact consideration.

Before the fact, and when we are planning for 10/20 years ahead, we have to consider whether we -- we still have to decide what would have happened in we hadn't launched these programs. So that when we changed the scale of the programs, as we are doing now for instance, we have some sort of baseline as a reference point. While both the EEI numbers and the basic load forecast numbers are forecasts, they are not forecasts of the same thing at all.

The basic load forecast is forecasting the total amount, to take the refrigerator case, the total electricity consumption of all refrigerators in Ontario in the year 2000. The EEI portion is really only addressing what is the change in consumption of refrigerators in Ontario due to efficiency gains that Hydro brings about.

So, that we have to distinguish these two. We certainly have to know what the demand for refrigerators would have been in the year 2000 if we hadn't intervened in the marketplace, and then we can ask the question, what is the load going to be given that we have launched programs to achieve a certain number of megawatt savings, I think it was 87 megawatts that we were going to take off that load by efficiency

improvement.

MR. B. CAMBPELL: Q. I am going to complicate this matter slightly further, as I inevitably do at all of our peril, by asking you to go back one step behind that to this lower -- you have described your basic forecast as, in effect, providing a base case or a reference case for measuring efficiency improvements and that reference case includes those efficiency improvements that would have occurred naturally. You have also spoken of this reference case that is a frozen efficiency reference case, and I am going to ask you just briefly again to explain the difference between that frozen efficiency reference case conceptually and your basic load forecast.

MR. BURKE: A. Okay. Well, as I have indicated, if we were to produce a frozen efficiency case, it would start from our basic load forecast. Our basic load forecast embodies changes in efficiency, changes in utilization, changes in market share, all in response to changes in prices, changes in economic activity levels, and changes in technology and other factors over time. And we would isolate out of that or try to isolate out of that simply the efficiency component and say, well, what if the efficiency of

equipment in Ontario was not going to change between now and 2015, what would that leave the forecast for load to be? And it would be a higher number, clearly, than the number we have got in the basic load forecast because you can expect that there will be efficiency improvement over time. And if you start from that frozen efficiency projection, you can then subtract all efficiency gains in future and end up with a forecast that would tell you what the load would be after all efficiency gains had been achieved. But, recognizing that the economy will still grow, that prices will evolve and change market shares, that people will spend incomes, their higher incomes on different things, and you would have a complete forecast. That would be Hydro's approach to a frozen efficiency case, simply to try to isolate the efficiency changes and freeze those.

And I guess I have complicated the matter by suggesting that there are other ways of developing a frozen efficiency case typically use in backcasting studies because backcasting studies tend not to want to take trends in market forces into account, and there is then a second way of looking at the distinction between Hydro's basic load forecast and this other type of frozen efficiency forecast which I really haven't discussed very much yet.

Q. All right. Well, that's just where I want to take you next, is to how this backcasting approach to frozen efficiency differs from what you have just described as Hydro's efforts in this area.

A. Yes. In the frozen efficiency approach that we have been using starting from a complete representation in the end-use model of the basic load forecast, I have been concerned about what that does to the ultimate bottom line projection of primary load because of the distortions introduced by essentially just freezing one element of an integrated forecast. However, these distortions that I am concerned about are almost completely absent; that is, the aspects of the forecast that are being distorted when we freeze one component are almost completely absent from a backcasting analysis.

In a backcasting analysis, in trying to avoid producing a load forecast at all, the frozen efficiency scenario simply replaces the existing stock at current efficiency levels and assigns current efficiency levels to all new stock.

There is some need for forecasting as you still have to forecast how much new stock there will be, but the methodology is really silent about how it addresses changes in market shares and utilization

changes in response to income and price and all the other factors that are important to a good load forecast, or a good load scenario. I don't care anymore whether it's a forecast or scenario. (laughter)

I wouldn't want to be hung up on the word.

Q. For purposes of this discussion.

A. For purposes of this discussion, thank you.

In fact, a frozen efficiency scenario in a backcasting context is really simply that, it is a scenario that freezes efficiency but it doesn't do anything else to market -- it doesn't do anything at all to market shares and intensity changes. What I would infer from that is that much more may be frozen than simply efficiency, and that if you were to try to produce a realistic case for planning purposes, you would require a very wide range of policy measures to replace the role of market forces that are being modelled in the load forecast exercises that Hydro undertakes.

...

[3:22 p.m.] So then subtracting the EEI potential estimates alone from that reference case may not be enough to turn that sort of frozen efficiency scenario into a realistic case for planning purposes. That's the point I had been trying to make.

Q. Now, in essence then what is your position on using as a reference case or starting from a frozen efficiency case rather than a basic load forecast?

A. I am going to summarize this one more time. Hydro has concluded that it requires a basic load forecast to set a realistic reference case for planning. The only valid way to a frozen efficiency forecast is via a complete end-use forecast and trying to just freeze efficiency is problematic.

Simply extrapolating the electricity consumption of existing and new stock at frozen efficiency levels in my view is worse. Given that you already have a basic load forecast, separating out natural from induced EEI is feasible and it can be done with an acceptable level of accuracy.

In Hydro's view these latter issues are much more tractable; that is, the issue of separating out natural from induced EEI is much more tractable in practice than developing a sensible frozen efficiency

forecast and for that matter the total potential EEI estimates to subtract from it.

Q. Now there are a variety of other reasons why Hydro's estimates of potential induced energy efficiency improvements could differ from those produced in other studies, and I would ask you please to outline those.

A. I will be brief. Apart from the broad methodological issues we have discussed, there are a variety of differences that can occur across jurisdictions that make comparisons difficult. These are the same sorts of things that make comparing electricity intensities across countries difficult or load forecasts that are made between jurisdictions.

Climate differences can result in different EEI results because some studies include space heating savings; others include air conditioning savings. The industrial composition of a jurisdiction or the mix of end uses in each sector can affect the amount of potential EEI. The base case efficiency levels vary widely between jurisdictions and avoided costs used by different planning entities vary widely.

In Hydro's studies we have included estimates of program delivery costs as part of the costs of the measures in our screening of EEI. Some

other studies do not do this. They simply look at the cost were you to buy it off the shelf.

And finally I would note that costs in Canada quite often can be much higher than the costs in the U.S. for some items, so comparing to U.S. studies can sometimes make things look more expensive here.

There are also different ways of reporting the savings as well. Hydro's estimates of potential EEI are for load reductions at the generator. Some studies report savings at the customer level and other studies go one step beyond the generator and report savings in terms of capacity. Essentially this is done by grossing up the load reduction by the required reserve margin so you get a much higher sounding number.

Q. All right. Now is there anything about the way that Hydro screens measures that would affect a comparison of Hydro's estimate of potential induced EEI with that of other utilities? For instance, does Hydro bundle uneconomic measures with economic measures when calculating potential?

A. No, Hydro doesn't. We have applied the total customer cost test to each individual technology. And we have done it at as detailed a level in each end-use application as we can.

Just to give you an example. The economics of high efficiency motors vary by load factor. If you have a high load factor application, the economics of an efficient motor may be so attractive that it would be a natural measure in the marketplace. If you have a low load factor load for a motor, it may be completely uneconomic to make that motor a high efficiency motor. And, in fact, the range that is suitable for efficiency improvement economically in Ontario is probably in some mid-range of load factors.

Many studies will take a look at that mid-range and say, well, that's economics, so all motors and all applications will save that amount. Effectively from our perspective that involves bundling both natural and uneconomic measures together along with the ones that are truly economic induced savings due to high efficiency motors.

There really is no justification from an economic efficiency perspective to packaging uneconomic measures along with economic ones just because the sum of the economics in the package is still less than the avoided cost of supply.

The only rationale for that would have to rest on an assumption that the avoided costs of supply

in some way were understated relative to demand side costs and that somehow bundling was a legitimate way of compensating for this.

Our position is that screening using the total customer cost test is the appropriate way to screen. Each measure should pass it. And should avoided costs change in future, then we should address that directly by re-assessing the economics of our measures using the total customer cost test.

Q. And the way that can change, the way the application of that test can change using an example that came up this morning, I take it, would be illustrated by the T8 lights in a religious institution. Mr. Shalaby gave a set of examples where a particular application had failed and Ms. Fraser said while a building was used more it might pass in that case. Is that the kind of detail you have to go into?

A. Yes. Ultimately the more you look at each specific example the more you would be able to distinguish at a finer level the economics of a particular measure.

Q. Now would you expect Hydro's estimate of potential induced energy -- would you expect Hydro's estimates of potential induced electricity efficiency improvements to change very much if avoided costs did

go up?

A. The short answer is no. There are very few technologies that Hydro has reliable cost and performance data on that are screened out at the current levels of avoided cost. In looking at other supply curves for other utilities and other jurisdictions, there are very few that contain higher cost measures than the ones on Hydro's list. And those measures would really only contribute a few percentage points to additional load reduction.

Now, the reason there may be so few high cost measures on these load reduction curves, that is, measures that are beyond the avoided cost levels that Hydro has, may be that in the absence of utility demand management programs, market economics has just not allowed commercial application of many of these technologies. And it may very well be that over time with much more utility demonstration of technologies that normally wouldn't make it in the marketplace, that these load reduction curves may fill out; there may just be a lot more information about technologies that are high cost.

But right now, significant increases in avoided costs, you would have to say would have almost no impact on our estimates of potential induced EEI.

That may change down the road.

Q. Could you summarize for the panel the factors then which need to be considered in making comparisons of potential electricity efficiency improvement estimates.

A. My purpose has been to provide some framework to the difficult task which the Board faces in assessing Hydro's estimate of potential induced EEI relative to other estimates that will be prepared for Ontario, have been prepared for Ontario, and are available from other jurisdictions. And I have tried to highlight some of the most important aspects that one might consider in making such comparisons. I would say there are five major elements of the analysis that need to be considered.

The first is the one that I spent the most time on which is almost the definition of potential EEI itself. Are you starting from a naturally increasing efficiency base or are you starting from a frozen efficiency base? Are you moving to the maximum economic level? Are you moving to the maximum technical efficiency level?

Are you incorporating the rates, the savings at a rate as if they were -- sorry, are you incorporating the savings as if they were derived

instantaneously or are you recognizing the factors which limit the rate at which even potential increases? That was the second point.

The third point is to recognize that there are numerous geographical and situational differences that are reflected in these sort of studies.

The fourth point is that there are a variety of ways that the results are reported. They may be reported at the generator level, they may be reported in terms of capacity savings.

And finally the way the measures are screened themselves. Some studies do bundle uneconomic measures with economic measures. Others don't.

MR. B. CAMPBELL: Now, Mr. Chairman, I think that's an appropriate time for the afternoon break.

THE CHAIRMAN: We will break for fifteen minutes.

---Recess at 3:34 p.m.

...

---On resuming at 3:49 p.m.

THE CHAIRMAN: Be seated, please.

Mr. Campbell?

MR. B. CAMPBELL: Thank you, Mr. Chairman.

Q. Mr. Harper, I want to turn for the second topic to you. It has to do with rate levels and marginal cost pricing.

Now, there have been a number of references both in the interrogatory questions and some of the questions on earlier panels to the concept of marginal cost pricing and suggestions that such an approach encourages the efficient use of electricity.

I want you to first, please, just describe what marginal cost pricing is.

MR. HARPER: A. Yes. To start off with, marginal cost is another way or term referring to avoided cost discussed in Panel 3.

I believe it is fair to characterize avoided or marginal cost as the increased cost of production system expansion arising from an increase in demand.

Having that definition of marginal cost in mind, marginal cost pricing is a scheme that sets the price of the last unit of electricity consumed by

each customer equal to its marginal cost.

The theory which I have tried to summarize on page 87 of Exhibit 260 is basically that if consumers have a free and informed choice and they face prices that are equal to the marginal costs for each good, then consumers will use a level of good that is economically efficient.

Looking at it the other way, the principle is that if customers face prices for a good that are less than marginal cost, they will buy more than what is economically efficient and demand will be higher than what it ought to be.

Q. Now, has Hydro ever contemplated using marginal cost pricing; and if so, why isn't it used now to encourage efficient use of electricity?

A. Yes, it has. As referenced in Interrogatory 4.2.3 --

MR. B. CAMPBELL: And I think that would be No. 10 in Exhibit 261.

THE CHAIRMAN: Is it 10 or 9.

MR. NUNN: 10.

THE CHAIRMAN: 10.

---EXHIBIT NO. 260.10: Interrogatory No. 4.2.3.

MR. B. CAMPBELL: We may have some repetition here. I may have got a little confused, but

I will sort it out with --

THE CHAIRMAN: You can straighten it out.

MR. B. CAMPBELL: Yes.

Q. In any event ....

MR. HARPER: A. Hydro did undertake an extensive study of marginal cost pricing in the early 1970s, the results of which were the subject of an extensive review before the Ontario Energy Board for over two years.

The OEB in its final report rejected marginal cost pricing for three main reasons.

Q. All right. Now, we have got to give kind of a sweep of the history of this thing.

When was its report issued?

A. In 1979.

Q. All right. And what were the three reasons that it rejected marginal cost pricing?

A. The first was what it referred to as the economics of the second best problem; the second was a lack of consensus on how marginal costs should be determined; and the third was the problems of reconciling the revenue earned by marginal costs with the revenue requirement of the corporation.

THE CHAIRMAN: Now, Mr. Harper, again, would you just try and go a little slower, please?

MR. HARPER: Sure.

THE CHAIRMAN: Those are three fairly meaty headings. Perhaps you might just repeat them for my benefit because I got as far as the second best and then I was stuck.

MR. HARPER: Okay.

MR. B. CAMPBELL: Q. All right. There were three main reasons for rejection. Perhaps you could just go over them again.

MR. HARPER: A. The first is what is referred to in economics as the second best problem; The second was a lack of consensus on how marginal costs should be determined; and the third were problems with reconciling the revenue earned using a marginal cost pricing scheme with the corporation's revenue requirement.

Q. All right. Now, I want to discuss each of these in turn starting with this second best problem.

A. The OEB concluded that what it referred to as piecemeal welfare economics cannot be supported. This referred to the fact that this theoretical underpinning of marginal cost pricing assumes that all goods in the economy, not just electricity, are priced at marginal cost.

And it was not -- and there was no clear case for the fact that if you just priced one good at marginal cost and not the others, you would be any better off in terms of promoting efficiency.

This is a very common problem referred to by economists as the second best problem. I think Mr. Rothman referred to it as well in his testimony during Panel 1.

THE CHAIRMAN: How did you open up your remarks. You were talking about welfare.

What did you say?

MR. HARPER: I guess when they are talking about marginal cost pricing, they often refer to it as welfare economics or the best consumer welfare, improving consumer welfare. So I think it is --

MR. B. CAMPBELL: Q. In the sense of encouraging efficiency?

MR. HARPER: A. Yes. So it is ...

Q. The theory being that the general welfare is improved if there is economic efficiency?

A. Yes, welfare economics, the general wellbeing of society, that sort of thing.

THE CHAIRMAN: But what I think I heard you say was that in order for it to be feasible, all

goods would have to be subject to marginal cost pricing; is that it?

MR. HARPER: Right. The way the theory is looked upon and assumed to work is if all goods are priced at marginal cost.

THE CHAIRMAN: All right.

MR. B. CAMPBELL: Q. All right. Now, the second issue, as I understand it, the second problem that the OEB identified was relating to the determination of marginal costs?

MR. HARPER: A. That's right. No consensus developed during the hearing as to how marginal costs should be determined.

In its report for both that hearing and subsequent hearings, the OEB has placed considerable weight on customer consensus and support when weighing weight-related matters; the reason being that all customers face the resulting rates and, therefore, it is important that customers understand and generally accept how they are determined.

One of the major issues around the determination of marginal costs for pricing purposes was whether Hydro should use short-run or long-run marginal costs.

The short run is defined as a period in

which plants -- a corporation or a company's capital and plant is fixed.

The long run is defined as a period of time over which that plant can be changed and new capacity investments can be made.

While pure economic theory suggests that one should use short-run costs, the resulting rates would be subject to considerable and probably unacceptable levels of instability and fluctuation. This is due to annual changes in reserve margins and fuel mix and things like this.

As a result, many practitioners argue for using long-run marginal costs on the view that in the long run, things will be more stable and you will get a more stable price evolving out of it. This doesn't necessarily always work because even the long-run cost paths change.

I believe it is fair to say that there is still no consensus on this issue among economists. NERA, or the National Economic Research Associates, one of the foremost consulting firms in the U.S. on marginal cost pricing, still advocates using short-run costs; while the World Bank uses long-run marginal costs for its pricing studies.

Even if one could determine the

appropriate marginal costs and the underlying theory was valid, the OEB cautioned that the subsequent pricing signals may not promote efficiency. This is because Hydro has to deal in the real world and their concern was that compromises, distortions and inconsistencies could be introduced in trying to take that theory and put it into practice.

Q. Now, the third problem that you spoke of related to the reconciliation of the funds that Hydro would receive if it priced at marginal cost to the revenue requirement of the corporation, and perhaps you could address that matter.

A. Yes. Marginal cost-based rates can produce revenues that are either higher or lower than what the corporation's annual revenue requirement, that is, the operations, maintenance, fuel and depreciation I spoke to earlier, would would require.

And there was no consensus developed during the hearing as to how to adjust those marginal cost-based prices so as to yield a revenue that would be equal to the corporation's annual revenue requirement.

Q. Now, apart from the concerns reflected in the OEB findings, are there other reasons why Ontario Hydro doesn't use marginal cost pricing?

A. First, in spite of the time that has passed, I believe a number of the OEB's conclusions are still valid. It is clear marginal cost pricing would result in greater rate instability.

Also, the Board's concerns about customer acceptance are still valid, the current pricing approach enjoys considerable support amongst other customers.

Having said that, I believe there are three other reasons why we haven't been following it and why we shouldn't.

First, while marginal costs are considered by many utilities in the design of their rates, there is no North America utility that, to my knowledge, sets its rates and overall prices based on marginal cost.

This has been confirmed in the recent survey that we did of utilities involved in innovative rate design that I referenced earlier in my direct evidence, and also, through ongoing information that we have received from the National Economic Research Associates, the consulting company that I referenced earlier.

The most any utility does is calculate preliminary rates based on marginal costs and just

adjust everything on a percentage basis back to rates that will actually yield the annual revenue requirement that the corporation needs.

Second, I believe it useful to observe at this time that setting rates on Hydro's marginal or avoided costs could well yield rates that are generally less than our accounting cost-based rates.

For instance, if you turn to Interrogatory 3.12.2 --

MR. B. CAMPBELL: And that we would number then No. 11 in Exhibit 261.

THE CHAIRMAN: Okay. All right.

---EXHIBIT NO. 261.11: Interrogatory 3.12.2.

MR. B. CAMPBELL: Q. Okay, you can carry on.

MR. HARPER: A. This interrogatory shows marginal or avoided costs for supplying a typical residential customer of roughly 4 cents a kilowatthour - they have expressed this in 1989 dollars - throughout the early 1990s.

Now, even if we escalate that 4 cents a kilowatthour up to 1991 dollars, it would still be less than the current residential rate of roughly 6 cents a kilowatthour. And, of course, lower rate levels would not tend to encourage reduced use.

Third, and finally, as referenced earlier, the Power Corporation Act is very explicit about the costs we should include in our rates and about how those costs should be translated into rates.

And I understand from our legal people that a full-scaled application of marginal costs would require a changing of the Act.

I also understand that the Premier has endorsed the principle of marginal cost and so I see such a revision unlikely.

Q. I am sorry?

A. Excuse me, I am certain the the principle of --

Q. I am certain that there are intervenors here who would love to hear it, but it is news to me.

A. Right, I apologize -- understand has endorsed the principle of power at cost. I was saying marginal cost so often throughout and as such, such a revision seems unlikely to me. It is from listening to induced and .... (laughter)

Q. Now, marginal cost pricing aside, would increasing rates generally encourage customers to use less electricity; and if so, why wouldn't this be a simpler or a preferrable method than using programs to

obtaining efficiency improvements?

A. First, I think it is fair to say, yes, increasing rates would encourage customers to use less. In fact, Interrogatory 4.2.47 --

MR. B. CAMPBELL: And we will number that 11, 4.2.47, in Exhibit 261.

THE CHAIRMAN: 12.

MR. B. CAMPBELL: I did. I did it. You are right, 12. I knew I would lose track of this eventually. 12, thank you.

---EXHIBIT NO. 261.12: Interrogatory 4.2.47.

MR. HARPER: Indicates that a sustained real price increase of 14 per cent would achieve a 2,000 megawatt decrease in electricity consumption.

However, as the interrogatory emphasized, such effects do not come overnight. In fact, a 12- to 15-year period could well be required before that full price effect would be passed through.

Also, while this result was calculated using our best estimate of elasticities or responses to price, there is some uncertainty with that elasticity estimate as there were with the time-of-use customer response elasticities I talked about earlier. And as such, there is some uncertainty even with the 2,000 megawatt figure.

Besides the uncertainty and the time frame required to obtain these results, there are a number of other specific reasons why increasing rates has not been advanced as a satisfactory method of promoting energy efficiency improvements as opposed to programs, and I would like to focus on five.

The first, rates are really just another form of financial incentive, like low-interest loans or cash rebates, the types of financial incentives Ms. Fraser was talking about earlier.

They do nothing to address the other barriers she has talked about, such as who pays versus who benefits, lack of awareness or product availability.

Also, I would question whether they would be the preferred financial incentive. Many customers, I am sure, would prefer to get their money all up front as opposed to waiting to get it year by year through their rates.

Second, unless one meters each individual end use and sets a different rate for the related consumption, rates cannot recognize the market segmentation that our programs do to the same extent. Programs can be fine tuned to address both the financial and the other barriers more effectively than

rates. The same rate applied to a number of segments just won't do that job.

Third, the premise, as Mr. Burke outlined earlier, underlying Hydro's overall approach to encouraging electrical efficiency improvements is that customers will receive the same or perhaps even an improved level of service.

Forcing customers to choose between using less through higher rates or cutting back elsewhere if they cannot does not achieve this objective. Programs do.

Fourth, and related to the previous two points, raising rates may encourage customers to use less; however, in my mind, it is not clear that such reductions would pass the total customer cost test. This is because the customers' payback requirements in the overall decision-making processes vary by end use and again, this can't be recognized at the rate-setting process.

...

[4:03 a.m.] Finally, on a more pragmatic note, during the DSP consultation process, our customers saw reasonable rates as an important priority.

Customers take some comfort in the fact that rates are based on costs and therefore they know what they are paying for. I must also confess that as one responsible for setting rates, I also take some solace in a cost-based approach. Cost provides a reasonable touchstone against which to work just as the total customer cost test does for our program people and abandoning it will leave us somewhat working in the dark.

MR. B. CAMPBELL: Q. Now, besides just simply raising rate levels, are there other ways that rates can be used to encourage demand management?

MR. HARPER: A. Yes. We can collect the same revenue in different ways using different rate structures. For example, I have already mentioned that we have time-of-use rates which collect more in the peak period and less in the off-peak period while collecting the same amount of revenue overall.

Q. And besides those rate structure alternatives which you discussed earlier, are there others which could be used to encourage efficiency improvements?

A. Yes. Another rate form that's commonly raised by utilities that which to encourage conservation is called the inverted rate structure where the unit cost per kilowatthour actually increases the the more the customer uses. In fact, as noted in response to 4.29.15 --

MR. B. CAMPBELL: We will number 13 of Exhibit 261.

THE CHAIRMAN: Give me that number again, please?

MR. HARPER: 4.29.15.

THE CHAIRMAN: Thank you.

---EXHIBIT NO. 261.13: Interrogatory 4.29.15.

MR. HARPER: The applicablility of inverted rates was reviewed by Hydro quite a while ago and considered to be an unacceptable way to price electricity. The reasons put forward are outlined in the interrogatory and I would like to summarize the main ones.

The main concerns were that the resulting rates seem to bear little relationship to cost; that the blocking structure that's introduced by such rates, i.e., where do you decide that the rates are going to go up, tends to be rather arbitrary as do the number of blocks, and that the rates actually send mixed messages

to customers. Customers using less see lower rates than customers using more, and it is not immediately obvious that customers that use less are actually more efficient.

Also, having made this observation, there is some overall concern and conclusion as to whether or not inverted rates actually encourage conservation at all since some customers are seeing lower prices and other customers are seeing higher prices. Overall these concerns are still valid.

Finally, I should point out that many of the U.S. jurisdictions adopting such inverted rate forms pursue them not for conservation purposes but rather for the life line aspect offered by the inverted rate. That's the fact that people using less pay less, and following the premise that low income customers tend to use less you are seen achieving some social objectives in terms of setting your inverted rates. There is a great deal of debate on as to whether utilities should be involved in such social ratemaking. However, that issue aside, the evidence included in the same interrogatory shows that the premise that low income customers use more just simply isn't valid.

MR. B. CAMPBELL: Q. I'm sorry, the premise that --

MR. HARPER: A. That low income customers use less - I'm sorry - is not valid.

Q. Now, are there any other ways utilities could use rates to influence demand management?

A. Yes. Other approaches include using connection fees to discourage non-economic uses; setting higher rates for end-use applications where the customer use is viewed to be inefficient, and establishing preset maximum demand levels above which higher rates would apply. These are approaches that could be investigated further; however, in doing so I believe many of the comments I made earlier about using rates versus programs will apply.

THE CHAIRMAN: That last example, that is a form of inverted rate structure; is it?

MR. HARPER: Yes. That's exactly what it is, except typically those preset levels are set customer by customer as opposed to just on a very aggregate basis.

As I said, I believe the comments I made earlier about using rates versus programs would still apply.

In particualr, the ability to appropriately target the desired end-uses; the effects

on the customer's overall quality of service, and elements of fairness and the fact that customers who use more already pay more would have to be considered.

I would like to offer one final caution in closing.

In Ontario considerable emphasis has been put on rate stability and customer impacts of rate changes and also on overall customer acceptance.

Even after the OEB set out its general principlies in it's report in 1979, it took 10 years of proposal, counter-proposal, consultation with customers and phasing in to get to the point where in 1992 we are just finishing our implementation of time-of-use rates. So, I would hesitate to throw the whole thing out and start all over again.

I think any change in rate philosophy and structures cannot be done without any very careful consideration.

MR. B. CAMBPELL: Q. All right. For the next topic I want to turn back to you, Ms. Fraser, and again start out, give me some context to this, that a number of interrogatories that were submited for Panel 4 implied that if Hydro were paying incentives at full avoided cost, you would achieve full penetration of the potential that Mr. Burke has described. What I would

like to ask you is whether you have an example of a program where you didn't pay such full incentives and still achieved a significant portion of the potential energy savings?

MS. FRASER: A. Yes, I do.

Our streetlighting pilot program achieved an 88 per cent penetration rate in only one year, and as a result, we accelerated the implementation of the province-wide streetlighting program.

In March 1989 we launched the pilot program in cooperation with the Ministry of Energy to encourage municipalities to convert their streetlights to high efficiency ones.

The pilot applied to selected counties in eastern Ontario and selected districts in Northern Ontario.

We offered financial incentives at 25 per cent of the total cost of conversion. By the end of that year, 82 of the 108 eligible municipalities had signed on to convert 22,000 of 25,000 eligible lights.

Q. Now, why did you start this program with a pilot program?

A. Well, there were a number of things that we weren't sure of that we wanted to tie down before we went province-wide.

First of all, it was the installed cost per fixture, we had estimates ranging from $200 to $500 a fixture; the appropriate level of incentives given that municipalities face capital constraints; the availabilty of qualified contractors, and there were other barriers and we are weren't sure what they were. We knew that there were savings to be had from improved streetlighting but we weren't sure why those conversions weren't happening.

We had done a survey of municipalities to determine what the current level of penetration of high efficiency lamps were and what their future plans for conversion were.

High pressure sodium lamps, represented in the overhead, 22 per cent of the lamps in the province but only 12 per cent of the electrical demand are the efficient streetlight of choice now, and that's become the standard for new streetlighting systems, but very few towns or cities had converted their existing system. Windsor had been the only city in Ontario to have done a total conversion and they had financed that with debentures over 10 years.

Some others, like Sudbury, had a long-term plan for conversion but were looking at 5, 10, 15 years before completion. Most municipalities

had no formal plans but agreed in principle that moving to higher efficiency lamps would be a good idea, but they didn't foresee streetlighting efficiency as a very important issue on the local agenda.

Q. Why should it be an important issue?

A. Well, as you can see from overhead page 89 of Exhibit 260, 35 per cent of a municipality's energy bill is for streetlighting and there are some compelling economic reasons for encouraging conversion, and in particular, for encouraging total conversion as opposed to a longer-term phased approach.

Now, as you can of see from page 90 in Exhibit 260, high pressure sodium lamps are more than twice as efficient as mercury vapour lamps, which had become the standards in mid '50s, and more than five times efficient as the incandescent lights which, for example, still account for about 75 per cent of the streetlights here in the City of Toronto.

Maintenance costs are reduced by as much as 75 per cent with high pressure sodium due to longer lamp life and group relamping. In fact, high pressure sodium lasts almost ten times longer than incandescent lamps, and inventory costs are reduced because only one type of light is used in two or maybe three different wattage levels instead of potentially five different

types, sometimes with five different wattages.

And finally, you end up with a consistent lighting system rather than the mix and match systems you sometimes see now with different coloured lights and different fixtures and so on.

Q. Now, it seems that the benefits were there. How did your program address the barriers, and we are going to work through that to the level of incentive that you have put in place.

A. Well, remember earlier when I talked about how important it was to be able to determine who was the decision maker? In this case, it would have been easy to assume that the key decision maker would have been the person in charge of the streetlights such as the head of Public Works or in some cases the municipal utility who maintained the streetlights for the cities, but that would have been wrong.

In discussions with individuals representing these groups before we launched the program, we learned that they were more or less comfortable with the status quo, particularly if having to change from that status quo meant change in their own department budgets, and so on. As a result, we realized that the leadership on this issue would have to come from the mayor or reeve and the council in the

town or city.

With streetlighting having the potential to be a sensitive political issue, we saw our task was to bring the opportunity to the attention of the elected officials, offset the financial barrier and arm the utilities and the Public Works groups with the information they would need to plan and evaluate a conversion project.

Q. How did go about doing that?

A. Well, we used our business finance plan to offer loans to cover the cost of conversion and determined that on average if we paid the interest on the load, the energy bill savings should be enough to cover the payments on principal. In other words, the conversion could be done with virtually no change to the balance sheet of the municipality until the loan was repaid and after that the cash flow would be positive.

We tested this idea on a few municipal officials and quickly realized that the option of taking a cash rebate instead of a low interest loan or zero interest loan was also required. The equivalent cash rebate was 25 per cent of the project costs. So, that's how we set the incentive level.

We also realized that we would need to

get a hook to get the attention of the mayors and the reeves and the council, so we held a high profile launch in both of the pilot areas to which the Minister of Energy and the Chairman of Ontario Hydro together personally invited the mayors and reeves, as well as the chairs of local municipal utilities. In both cases, we asked the local mayor to be the master of ceremonies for the event, and in both cases they virtually committed to the project on the spot, demonstrating leadership among their peers.

We had preceded the profile event with consultation sessions with local municipal utility staff and Hydro field staff followed up with presentations to town councils, technical assistance and information.

Q. And meanwhile were you doing anything with these allies that we have heard about throughout your testimony?

A. We held an ally seminar, educating them on the program details and the rationale for the program. Needless to say, they were very positive given the prospect for increased business.

We had also worked with the Streetlighting Committee and the Municipal Electric Association to develop the program and they endorsed it

to their member utilities.

Q. Now, all of that sounds fairly positive. Was that it? Was that all you had to do to make this program a success?

A. Well, I wish it had been.

We quickly hit some snags that we had known about but we had underestimated their impact.

The most difficult one was the issue of PCBs in the mercury vapour ballasts. This isn't an issue with one at a time replacements, because the Ministry of Environment's guidelines only cover a significant amount of PCBs, but this was clearly a concern with the total conversion project. Any PCB-laden ballasts had to be handled according to the Ministry of the Environment guidelines and stored in a registered PCB storage site.

Municipalities that had municipal utilities maintaining their streetlights were able to rely on them to handle the problem because they had PCB storage sites for transformers, but towns and townships without a utility did not, and were hesitant to participate in the program if that meant they had to get into the PCB storage business.

We weren't about to let this issue stand in the way of the anticipated energy savings however,

so we had Hydro's area offices take the ballasts and store them in there sites. However, this required much negotiation with the Ministry of the Environment because they are no set rules on such matters in terms of transfer of ownership.

Then once we got the okay for storage from the Provincial Ministry of the Environment, we discovered that we had to go to Environment Canada in Ottawa to get permission to transport the ballasts, but with this issue out of the way the program took off.

...

[4:20 p.m.] By the end of the year, 76 per cent of the pilot municipalities converted 88 per cent of the eligible lights. And I just learned yesterday that one of the major hold-outs in the pilot that wanted to get involved in the program has agreed to go ahead with the program in the province-wide program; and if they had been able to go ahead and had the money at that time, the penetration rate would have been 93 per cent.

So, with such positive results, we felt confident in making the same incentive offer to the rest of the province.

Q. Now, this is clearly an example of a successful program. It didn't require a hundred per cent incentive. How does that compare with other streetlighting programs of which you are aware?

A. The only comparable program that I know of was Bonneville Power Administration's program. Now BPA is a large wholesale utility in the American Pacific Northwest and was one of the pioneers of demand management. Their streetlighting program ran for five years and achieved 33 per cent penetration, even though Bonneville was paying 100 per cent of the conversion costs.

Q. Now how do you account for the difference between your program, clearly successful, 25

per cent incentive; Bonneville, 100 per cent incentive, but a much lower penetration rate?

A. Well, from the data I have seen on this program, 99 per cent of the cost of the program was the incentives and the remaining 1 per cent was for administration. It doesn't appear that they included any promotion, information or technical assistance in the program. And I also suspect that they didn't target the right decision maker in the right way.

Q. Is this an example of how it may not be necessary to have incentives that pay the full cost in order to achieve good results?

A. True. They weren't necessary in the streetlighting program. However, in other cases we may have to pay the full cost of the efficiency option. We are doing so in the upcoming nonprofit housing program and we are paying the full incremental cost in other programs which I mentioned yesterday, such as the residential streetlighting window program that Ms. Mitchell talked about.

What is critical here is understanding the marketplace and the needs of the decision makers. And as we get more experience and increasingly target our programs, as we are doing now, we will determine where we have to pay higher incentives and where we

don't.

Q. And could you comment on the kind of suggestion that has been behind some of the interrogatories we have seen that clearly uptake levels would be much higher simply if you paid the extra cost of efficiency options.

A. Well, I don't think that approach would be cost effective. Anyway it's not that simple. One of the biggest myths that we face in the area of demand management is that energy consumers make rational economic choices and therefore all a utility has to do is change the economics of the situation to change the pattern of energy consumption.

Now, I am not suggesting decision makers aren't rational; in fact, they are quite rational. But factors affecting their decisions are complex and rarely based on energy consumption. Most often, energy use is locked in by purchase decisions about equipment and systems -- sorry, energy use is locked in by purchase decisions about equipment and systems that are affected by factors that are much more important to the decision makers than future energy consumption.

To return to Mr. Burke's favourite example of refrigerators, any incentive that fully offset the premium cost of a more efficient model

wouldn't get much attention if that model didn't have all the features that the purchasers demanded, such as a frost-free feature and so on, or if it were smaller than the less efficient model. We have to be aware of the customers' energy service needs, not just that they use electricity. We have to look at all the factors they take into account in making such decisions if we want to change those decisions.

Q. How do you take those factors into account when you are determining incentive levels?

A. Well, first, we do consider the price of the product. By and large we set incentive levels to bring the payback required for the investment in the more efficient option into the range acceptable to the customer.

However, as I have said before, there is no one magic payback period for all customers. We use the market research and pilot programs to test incentive levels and structures. We have ongoing dialogues with manufacturers, distributors and contractors to gauge reaction to suggested and actual incentive levels.

But of course there is never one simple price. Prices depend on a number of factors: volume discounts, competition, pricing policies and so on.

In the streetlighting program that I talked about, we communicated a lot on the kinds of prices that different municipalities were getting, what kind of quotes they were getting; and as a result, the competition in the marketplace increased and the prices were coming down.

But if we began paying a hundred per cent of incremental costs as a matter of policy, I expect that the tendency of the contractors and distributors would be to widen the differential because they know Hydro is going to pay the difference.

And as I said, our experience to date has been that suppliers have been equipped to reduce the premium for efficient products; even with shortages of some lighting products, prices have come down. Things that used to be special orders are now stocked as a matter of course.

Secondly, it's not just the incremental equipment costs that have to be factored in. A lot of energy efficient improvement measures not only save energy but yield other benefits as well. For streetlighting we saw reduced maintenance cost to reduce inventory costs. In setting incentives, we do recognize that the purchasers would rather see their savings sooner than later, as Mr. Harper just pointed

out, but offsetting benefits have to be accounted for and communicated to them.

Third, just the fact of Hydro putting an incentive on a product, even if it cost more with the incentive, has a kind of a stamp of approval effect. This is particularly critical for products that are new to the marketplace and as a result have a high level of technical risk, real or perceived.

Hydro's incentives for the relatively new, at least to Ontario, T8 lighting technology has had a dramatic impact on the acceptance of this product and the speed at which ballast manufacturers are moving to get new electronic ballasts to match them on the market.

Fourth, Hydro's incentive also raises awareness. I call this the flashing blue light effect, the flashing blue light at K-Mart effect. In cases where low levels of awareness of an energy saving product and its related benefits are the major reasons for its low levels of penetration, consumer interest resulting from the incentive makes a big difference.

In these cases, paying incentives at full incremental cost, let alone full avoided cost, would be a real waste of money. And we also have to be sure that the industry infrastructure can handle the demand.

It is not just products; it is also services. And incentives won't make a difference if that product or service isn't available.

And finally, we had to be sure that Hydro could develop effective administrative processes to handle incentives. Bogging customers down in red tape would be a sure way to limit penetration.

Q. Now when you take this approach to incentives, if you find after all of this that you believe that higher incentives are required, are you able to go back and adjust the programs in that way?

A. Well, first of all, I guess as I have already said, I believe that it's a waste of money to start with higher incentive levels because we might never know if the lower ones would have done the trick.

So our approach has been to start with what we considered to be a reasonable incentive and we fine-tune base on market reaction. We keep close tabs on the customer and industry response to incentives through market research and ongoing working relationships.

However, where higher incentives are required we do use them. We have increased incentive levels for most of our programs. Interrogatory response 4.20.45 details all of our incentives changes.

MR. B. CAMPBELL: That would be No. 14, I believe, on Exhibit 261, 4.20.45.

---EXHIBIT NO. 261.14: Interrogatory No. 4.20.45.

MR. B. CAMPBELL: Q. Now do you ever set incentives at a hundred per cent of incremental cost or for that matter a hundred per cent of the whole project costs?

MS. FRASER: A. Yes. We are using incentives that cover a hundred per cent of incremental cost, and I mentioned that earlier for T8 lighting and new construction or in our residential window program. And we use incentives that will pay a hundred per cent of project costs and arrange for insulation in a nonprofit housing program.

In new construction it's critical to avoid lost opportunities and the incremental cost of upgrading at the design stage is less than doing it on a retrofit basis. For residential windows, incentives can be used for new construction or when homeowners are renovating, investing in new windows any way. The incentive pays the difference in the cost for upgraded windows.

For nonprofit housing, the nature and structure of ownership and tenancy is such that raising money for capital improvements is very difficult;

whereas, passing increasing utility costs on is very easy.

We also structure incentives to encourage customers to opt for EEI measures which provide more and longer lasting benefits. We pay a much higher incentive for T8 lighting, including the fixture, than for energy saving T12 lamps. The latter save energy but give reduced light output and can be easily replaced with standard T12s, while T8s, which save even more energy, provide equivalent light levels, and better colour rendition but cannot be easily replaced by standard lamps.

Q. Overall then, do you see incentives as addressing more than simply straightforward financial concerns?

A. Yes, I do. But we are still in the learning stage. What is clear is that incentives are only a part of total program design. Incentives play both a financial and non-financial role in that program design. As our streetlighting program shows, careful targetting, strong technical support, keen allies, and sufficient incentives were all necessary ingredients for success.

Q. All right.

Mr. Wilson, I want then to turn to you

for the final area of our testimony. And again just by way of introduction, we have heard from Mr. Burke on the potential for load reduction by way of fuel switching and electrical efficiency improvements. Can you tell the Board, just briefly summarize how standards and mandation can work in these efforts to make Ontario more energy efficient.

MR. WILSON: A. We have established through discussions yesterday and today that the economic level of efficiency for products and building codes is well above the minimum requirements of standards today.

The purpose of our programs is to inform customers and other decision makers about the merits of demanding better products and better buildings, working with allies to make products and services available and to provide incentives, as Ms. Fraser has just described, to overcome the barriers, both financial and otherwise. But Hydro only has market forces at its disposal. That's all we can work with. The area of legislated standards is beyond our mandate.

Now government's active participation in efficiency standards is required to achieve the greater level of energy savings that we have been talking about. And that's why last December, Hydro's board of

directors sent a resolution to the Minister of Energy, and I will quote from that. It strongly encouraged:

> "...the government to expeditiously implement ambitious efficiency standards for electrical products presently covered by legislation, and also for a wider range of electrical products, to achieve no less than harmonization with USA standards.
>
> "...to expeditiously implement an energy efficient building code."

And further:

> "...the introduction of standards be applied to all energy forms in order to provide a consistent basis for achieving broader government energy policies."

Now since standards and codes have traditionally been developed through consultation processes with equipment suppliers, the pace of development is normally measured in years. Nonetheless, it's our expectation that the kind of stringent measures that we are visualizing can be put in place by 1995.

But once they are, Ontario will immediately benefit from a hundred per cent penetration

for the efficient equipment and buildings that are covered by that legislation and regulations. And this is the level of market penetration that's well beyond the reach of our programs.

Q. Now do you believe that Hydro --

THE CHAIRMAN: I'm sorry, I didn't get that last point.

MR. WILSON: Well, this level of market penetration of a hundred per cent is beyond the reach of our programs. With regulations there is no option but to build a high efficiency home.

...

[4:35 p.m.] We can provide incentives for R2000 homes, but not all builders will build them. If that becomes the building code requirement, then there is just no question that the homes will be built to the higher standard.

THE CHAIRMAN: Well, you are saying that dealing with these standards and regulations is an essential condition to your program; is that what you are saying?

MR. WILSON: For the level of accomplishment that we were outlining earlier today and yesterday, yes, it is.

THE CHAIRMAN: You won't make your 5200 megawatts unless there is some action in this area; is that right?

MR. WILSON: That's correct.

THE CHAIRMAN: Does that mean all action, some action or a little action?

MR. WILSON: Well, I think there is a very substantial amount of action and I described quite quickly, I think earlier today, the five cases that had varying degrees of action and--

THE CHAIRMAN: I see.

MR. WILSON: --the very expectations that would go with them.

THE CHAIRMAN: So, you are talking about Cases A and B; is that right?

MR. WILSON: Case C is probably closer to the mark.

THE CHAIRMAN: All right. Thank you.

MR. B. CAMPBELL: Q. I think, Mr. Wilson, you also pointed out though that the assumptions behind Case C and -- maybe I will put the question to you this way: Was it your view that the assumptions, the formal assumptions behind Case C in Exhibit 258 were the only way of getting there?

MR. WILSON: A. No. As I pointed out, there are a number of different ways to achieve those objectives, and I gave an example of possible standards arriving in 1996 but perhaps being a little more stringent than we assumed.

There are obviously some variations on that and it is an area for discussion between ourselves and government and many other parties over the next year.

Q. Now, do you believe that Hydro can make a valuable contribution to getting regulations in place by 1995? Are there things you can do to make that easier?

A. Yes, there are. We can make an

important contribution by creating an environment that makes these regulations possible and acceptable in Ontario and by building up the infrastructure of allies that are needed for the success of these regulations.

Q. Now, what kind of steps is Hydro prepared to consider to support these efforts to move towards expeditious implementation of ambitious efficiency standards?

A. Well, there are six areas that I would like to address. They are shown here on the screen. In brief, they are our participation with federal and provincial organizations that shape and set standards; research and development to help make high efficiency products and building designs available; economic development systems to manufacturers and distributors to expand the availability of these products; programs to make a market for them prior to 1995 and even beyond; promotion of the need for - this is promotion to people who make the decisions and buy the goods - of the need for efficient products and, in fact, the reliability, the fact that they can count on these products; and last, the support, educational support, for the development of the trades and professional training that are needed to provide skilled people to make these standards workable.

Q. All right. I am going to ask you to elaborate on each of these points, and the first one I would ask you to address is participation in federal and provincial organizations.

A. We have already been active for a number of years in participating with federal and provincial organizations that set standards. We have been working at all levels in the Canadian Standards Associations' efforts to advance safety and efficiency of electrical products.

We have worked with the federal government's energy, mines and resources department to sustain funding for an update of the 1983 measures for energy conservation in new buildings. That is a model standard which has been a baseline for building code development and is in the process of being upgraded; and to support the continuation of Energuide, which is a labelling, a plant's efficiency labelling program.

Now, without our financial support and technical support, both of these initiatives would have been dropped last year. Now, something similar would have happened to the R2000 home program.

We have been working with the Canadian Electrical Association in research and development for more efficient products and voluntary standards such as

the CEAs 'EE' home standard. And we have been working with the Ministry of Energy on the regulations under the Energy Efficiency Act and research into overcoming the practical problems associated with putting full height basement installation in place so that the next revision of the Ontario Building Code will include this energy saving measure.

The task of accelerating the pace and stringency of efficiency standards and codes that I outlined in the those cases - B, C, D and E - will require an unprecedented level of commitment and cooperation from all parties.

Hydro will lend its expertise and support to all efforts to narrow the gap between current standards and the economic level of efficiency improvement.

Q. Now, the secondary you addressed was research and development.

A. Hydro has one of the best research establishments in Canada. We are prepared to consider using that facility to advance the creation, development, testing demonstration and commercialization of high efficiency products in building designs. And this will be just an extension of the R&D and testing services that is Hydro has

operated for over 70 years.

Through these efforts, Hydro would develop testing procedures that are needed to certify products and designs for conformity with efficiency standards and codes.

Research will reduce resistance to higher standards by identifying and helping to resolve for feared or real undesirable side effects of these products. And if necessary, we might even be able to set up a product certification testing service as an interim measure until other agencies can pick up the slack on this.

Q. The third area was economic development and I would ask you to address that.

A. With the proposed amendments to the Power Corporation Act, Hydro will be able to work directly with manufacturers and distributors to expand the availability of energy-efficient products. And this is another area where Hydro's R&D capabilities may prove to be valuable in helping manufacturers develop cost-effective, high efficiency products.

We believe that the accelerated development of efficient products and sharing of development risks may be an effective means for building earlier acceptance of stringent efficiency

standards.

Q. And the next area was programs.

How can you use them to help support standards and mandation?

A. Hydro's programs will smooth the transition to higher standards by making a market for efficient products today and by accelerating the efforts planned over the years to 1995 to reduce the business risk for entrepreneurs who create and sell efficient products and for decision-makers who specify efficient products and buildings.

Our programs will help manufacturers generate the cash flow that they need to support the cost of redesign and retooling for these new product lines.

These programs will also enable energy efficiency from allies, such as distributors and contractors and so on, to gain experience with the performance reliability and customer satisfaction questions that create risks for new product development and to retard the adoption of more efficient products.

Beyond 1995, our programs will continue to support best available efficiency technology and so keep pushing back the limits and reduce market barriers.

This continuing effort to make a market for the best efficient products would help all industry allies earn a greater return on their investment in product changes and skill development.

Q. The next item was promotion.

A. Well, beyond making a market for efficient products and building designs, Hydro is going to be selling the public and consumers in all markets on the virtue, in fact, the necessity of efficiency both in products and building design.

The concepts of energy efficiency cost effectiveness and environmental friendliness will be established in consumers' minds. This will reinforce the competitive advantage of companies who are prepared to lead the way and build the base of public and corporate support that governments need to enact energy efficiency legislation and to set stringent regulations.

Q. And finally, in the area of education.

A. We will continue to work with the provincial government and others to upgrade the knowledge and skills of professionals and trades who will design, specify, install and service these efficient products and buildings of the future.

Now, without this infrastructure in place, there will be enormous resistance to significant improvement of standards, codes and regulations. And for that matter, there will be little real progress even with the standards in place if the trades and allies in Ontario were not capable of putting the products into place.

That is why we are going to work with trade associations and colleges and universities and professional organizations - and you have heard from Ms. Fraser that we have already started that - to enhance the training and education that are needed for the 1990s.

Now, there are probably other ways we could assist in the expeditious development of standards. And as we learn about them, we will assess how they can be best combined with our other efforts.

MR. B. CAMPBELL: And with that note, Mr. Chairman, on the support for standards and mandation programs that Ontario Hydro can offer, I believe that concludes our direct testimony.

And I would like to suggest whether Ms. Couban does or not -- that the panel not be asked to go under cross-examination now; that we commence in the morning.

---Off the record discussion.

THE CHAIRMAN: This is not cross-examination.

MR. B. CAMPBELL: I have told the panel that in terms of talking to them, it is, but perhaps we can treat that as an exception.

But if my memory of Panel 1 is correct, I lived in mortal terror of Dr. Connell's hypotheticals. I don't know whether this is one, but I don't have any control over it anyway, so I just ... sure.

DR. CONNELL: A few perhaps benign observations. (laughter)

Going back to yesterday morning, I noted at one point Mr. Burke making clear that the general purpose of demand management programs was consistent with the notion that there will be no expectation of changes in values and aesthetic standards. You used, I think, the example of an exterior wall covering and wallboard.

And at another point, Mr. Wilson testified that maybe one of essential features of demand management was behavioral change. And I think we have seen a number of illustrations of changes in attitudes and behavior in the course over the last two days. I would welcome just some more reflection on

that point and whether change in attitudes or even values could become quite a deliberate part of the program.

MR. BURKE: Well, maybe I will start by clarifying the sort of thing we hope to hold constant or at least improve, and then perhaps Mr. Wilson will address the sorts of changes that we may need in order to, in fact, make our demand management program successful over time.

The intention in examining measures for electrical efficiency improvement is to purely improve efficiency in providing the same service.

And my point in the way I presented my information was to indicate that the quality of the service that the customer receives should not be affected by the fact that it is provided more efficiently. That doesn't mean that all kinds of attitudes might not change for other reasons.

But essentially, I wanted to indicate that when Hydro looks at the costs of measures, it looks at the costs that return the customer service level to the position from which they started; that is, customers do not have to give something up in the course of becoming more electrically efficient. That was what my point was and I think Mr. Wilson's is

slightly different.

MR. WILSON: I think my point is different. There is a distinction between not wasting a valuable resource and being entitled to receive whatever you are prepared to pay for.

So, the notion of conservation or efficiency is that if you are looking for a comfortable living room to sit and read the paper in the evening, you are entitled to that as long as you can afford it. If we can use programs to make it cheaper for you to do that, at least we would get the service need - satisfy that service need - and that is what our programs are all about.

...

[4:50 p.m.] Mr. Burke was perhaps suggesting that better insulation in the walls was the answer and he was estimating the cost of upgrading the windows and the walls in your living room. He would also include in that the fixing of the inside of the wall back up, put the wall paper back on so you weren't looking at bare studs and blocks of insulation. We had to take the cost of the whole job into account when we were assessing the merits or not of some task.

We also talked a little bit about not trying to cause lifestyle changes or forcing them on people, and then I talked about looking for a culture change in Ontario.

I think a lifestyle change is just the opposite of what people in Ontario want. They are proud of their ability to make their way in life and to make a better life for themselves and their families, and are not really enthusiastic about reversing that trend.

The culture change that we are looking for we can achieve by providing them with information about options they don't even think they have. They can get what they want and get it cheaper or more efficiently, perhaps in a way which is more benevolent to the environment, and that touches on values that

they hold dear.

So, as we provide them with the information, that indeed will change their behaviour. In fact, the most fundamental behaviour change we are looking for is purchasing behaviour. We want them to ask for or look for compact fluorescent lights. We want them to choose energy-efficient windows, and all these other things we talked about.

I suspect as the behaviour changes, bit by bit you will see a change in the culture that goes beyond just buying things, but getting your kids to flick the lights off when they go out of the room and turn the TV set off when they get called to dinner. Who knows, this might be natural by the year 2000. It isn't in my household yet.

DR. CONNELL: I think that is a helpful elaboration, but it prompts me to just speculate a little further an issue which I think is proximate but a little more remote from the issues you have raised might be urban planning. I think there is a new look now in urban planning, certainly in the draft Toronto City plan, and I expect that there are a lot of issues on the table in our urban areas which have a bearing on efficiency of use of electric power. I wonder if Hydro would go so far as to become engaged in those

deliberations and to be doing assessments and pointing out matters of zoning and density and regional distribution of services which might have a bearing on electrical efficiency.

MR. WILSON: Well, to my knowledge, such improvements or opportunities are not included in our estimates of efficiency or load reduction opportunities.

Is that correct?

We have participated with the City of Toronto and the provincial government in their assessments of global warming, reduction or the abatement of CO(2) emissions and volatile organic compounds and groundlevel air pollution, and all this sort of thing.

To the extent that these initiatives lead us to assist others in sizing up the electrical implications of other objectives that society has, we will likely continue to do that.

DR. CONNELL: Thank you.

I was interested in Ms. Fraser's references to energy service companies, and I gather there are now energy service companies operating in Ontario.

MS. FRASER: Yes, there are about seven

energy service companies that have been operating in Ontario for probably -- some upwards of about 10 years. And some were about to get out of the business when we came along with our programs and convinced them to stay in it, and there are some more now coming in from United States.

DR. CONNELL: Would you say that the industry in Ontario is as highly developed as it is anywhere in North America?

MS. FRASER: I don't think it is quite as developed as in the United States. It's certainly not as developed as it is in Europe. However, I would characterize that in North America generally, the energy service company is -- I would say it's moved sort of recently from a fragile state to a developing state. It still has a very specific market, target market. It primarily deals with the institutional market because they know that those hospitals and universities are going to be in business down the road, and so we are certainly looking at helping them make the transition into other types of operations.

DR. CONNELL: If it were much more highly developed, would that enable Hydro to reduce its emphasis on energy management programs and development to some degree?

MS. FRASER: No. I see what we are doing as being a very complementary to what the energy service companies are doing.

As I indicated when I described the guaranteed energy performance program, we are really expanding the kinds of things that they can add into their performance contracts. They tend to deal with things with around a 3-year payback or less. We are beginning to look at things which have a 5- and 6-year payback; because of our incentives it then brings it down into the 3-year payback kind of range.

I don't foresee that, from my understanding in terms of our research, that customers are interested in entering into longer performance contracts with energy service companies at this time. That may evolve where a company ends up passing over the total operation of its physical plant to a third party, that's certainly down the road.

DR. CONNELL: But to take your example of the city lighting, do you think that initiative would have been beyond the reach of a private corporation if they had happened to have your insight and ability in that field?

MS. FRASER: No. As a matter of fact, one of the street -- the largest streetlighting company

in Ontario also has a performance contracting arm, a lighting service company, that does that on a performance contracting basis and they have been knocking at the city's door for quite some time with that proposal.

DR. CONNELL: So, if the whole thing had been done in the private sector with similar success, then we would be saved the cost of that program, at least the 25 per cent on the public purse or at least --

MS. FRASER: If they had done it, yes. That's the whole point of our programs, is to crack away at those barriers that, for whatever reason, people don't necessarily do the things that are always economic.

DR. CONNELL: Yes. Does the energy management branch operate in any way like a private corporation? Is there any revenue, for example? Do any of your services generate revenue?

MS. FRASER: Nothing substantial. We do sell our commercial energy manual to other provinces and things of that nature, and to utilities in the States and things like that, but that's not substantial.

It's one of the things, an option that we

looked at when we both considered the streetlighting program and when we were looking at the way in which we would interact with energy service companies, whether or not developing the energy service arm might be an appropriate thing to do. Basically the advice that we had from our consultant at that time was that we needed a lot more experience in the business, and we certainly agreed with them.

It's something that some U.S. utilities have done, they have acquired, purchased energy service companies, and they have started them and then sold them off. So, the jury is really out on the best way to do that.

DR. CONNELL: But you don't think it would be possible to achieve what you have achieved and what you propose to achieve on a cost recovery basis at this time?

MS. FRASER: Not at this time using the same kinds of financial making or financial decision-making criteria that are being used in the private sector at this point.

---Off the record discussion.

THE CHAIRMAN: I think, it now coming to five o'clock, we will terminate for today. Dr. Connell has some further questions, after that it will be Ms.

Couban.

MS. COUBAN: Yes. If I could, Mr. Chairman, just one moment.

I think it may be of assistance to my friends, the intervenors, if I note the exhibits I will be referring to because many of them are exhibits that they may not ordinarily bring with them.

THE CHAIRMAN: Yes.

MS. COUBAN: So, for the benefit of those who would like to follow my cross-examination - I have provided this list to Mr. Campbell and to Ms. Morrison - the exhibits will be Exhibit 3, the DSP Plan Report; Exhibit 4, the Environmental Analysis; Exhibit 25, which has already been referred to, Demand Management in the 1989 DSP; Exhibit 67, which is the draft DSPS report, No. 666A/SP; Exhibit 69, which is the review by Government Ministries of Ontario Hydro's Draft DSPS; Exhibit 146, which is the Government Review, and Exhibits 257 and 258, which are the fuel-switching exhibits. I will also very briefly refer to the New Energy Directions Policy, which is Exhibit 177, and also to what is now Exhibit 261.6, which is the independent consultant survey, or the Hagler Report, and I will provide a copy of that to my friends tomorrow.

Thank you, Mr. Chairman.

THE CHAIRMAN: Thank you, Ms. Couban.

We will now adjourn until tomorrow morning at ten o'clock.

---Whereupon the hearing was adjourned at 5:02 p.m., to be resumed on Thursday, August 22, 1991, at 10:00 a.m.

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E R R A T A
and
C H A N G E S

To transcript for Tuesday, the 20th day of August, 1991, Volume 47.

Exhibit 259 on page 8372 should read "Errata for Exhibits 25 and 76."